

Vol. XX

No. 10

DISSERTATION ABSTRACTS

*ABSTRACTS OF DISSERTATIONS AND
MONOGRAPHS IN MICROFORM*

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ANN ARBOR, MICHIGAN: 1960



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AGRICULTURE

AGRICULTURE, GENERAL

PREVENTION OF *SCOLYTUS MULTISTRIATUS* TRANSMISSION OF *CERATOCYSTIS ULMI*, THE DUTCH ELM DISEASE FUNGUS, BY SYSTEMIC INSECTICIDES.

(L. C. Card No. Mic 60-978)

Abdulla Flayih Al-Azawi, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Dale M. Norris, Jr.

Systemic insecticides and DDT were investigated as a means of controlling *Scolytus multistriatus* (Marsh.) and thus preventing transmission of the Dutch elm disease fungus, *Ceratocystis ulmi* (Buisman) Moreau.

Toxicity of various organophosphate systemic insecticides to the beetle was investigated by applying the insecticides in acetone solutions to cut ends of fresh elm twigs (0.5-inch in diameter and 3.8 to 4.5 grams in weight) and confining adult beetles on the twigs to observe mortality. In the field, systemic insecticides were applied to elm trees by trunk injection methods, then the insecticide uptake, translocation and persistence were studied by tissue analysis using the cholinesterase-inhibition technique. The toxicity of branches from these trees was tested by a beetle bioassay method. In transmission studies, fungus-contaminated beetles were confined in sleeve-type cages on random branches of treated and control trees; test trees showing Dutch elm disease symptoms were cultured to confirm fungus infection. Investigations were also made on the persistence of DDT residue on sprayed street elms. In addition, five elm clones were tested for variation in resistance to beetle feeding.

The toxicity of various organophosphate systemic insecticides and DDT to the beetles was as follows, in order of descending toxicity: (Thimet, dimefox and Bayer 19639), DDT, (demeton, Am. Cyanamid 12880 and Am. Cyanamid 18706), Chipman R-6199 and R-6200.

The presence of leaves was of chief importance in enhancing the uptake of systemic insecticides. Under this condition, the insecticides moved up immediately and were detected within the first day after treatment. However, the distribution between branches was not uniform.

R-6199, demeton, dimefox and Thimet persisted in the foliage for over 17 weeks. By the second season R-6199 was reduced to one-twenty-fourth of the original p.p.m. in the foliage and to one-seventh in the twig bark. Analysis showed that R-6199 was also present in the trunk bark.

There was evidence indicating that R-6199 prevented beetle breeding in elm logs of treated trees.

Bioassay of twigs from trees treated with R-6199, demeton, dimefox and Thimet showed that R-6199 was the most toxic and most efficient in reducing the extent of beetle feeding.

R-6199 was applied to 2-inch d.b.h. elms at 10, 20 and 30 grams per tree gave an overall beetle mortality of 91 percent and showed some repellent action. The extent of twig feeding was reduced from 78 to 90 percent as compared to that of the control.

At dosages of 10, 20 and 30 grams per 2-inch d.b.h. tree, R-6199 prevented fungus infection whereas up to 33.3 percent of the controls developed Dutch elm disease symptoms.

Studies on feeding scars showed that scars 3 mm. or longer in treated as compared to 2 mm. or longer in control trees may result in xylem feeding and hence possible infection. Accordingly, 12.5 percent of the total scars from treated trees were infectable as compared to 89 percent in the control trees.

Bioassay of DDT-treated trees showed that fall application was less effective than spring spray in controlling beetles and preventing fungus transmission.

No conclusive data were obtained from testing the feeding preference of the beetles to five elm clones, American, Chinese, Buisman, Moline and Vase.

In conclusion, R-6199 was the most effective systemic insecticide in controlling elm bark beetles and preventing fungus infections of elms. Aspects of this study which need further investigation are, 1) improvement of the application technique to reduce chemical losses and equalize distribution between branches, 2) correlation of insecticidal dosage with tree size, 3) determination of the effectiveness of systemics in preventing beetle breeding, 4) evaluation of other systemic insecticides, and, 5) development of controls for other vectors and pests of elms.

Microfilm \$2.50; Xerox \$5.60. 113 pages.

AN ANALYSIS OF INDUCTION TRAINING FOR SUPERVISORS IN THE COOPERATIVE EXTENSION SERVICES OF THE SOUTHERN AND WESTERN REGIONS OF THE UNITED STATES

(L. C. Card No. Mic 60-983)

Marden Broadbent, Ph.D.
University of Wisconsin, 1960

Supervisor: Associate Professor Gale L. VandeBerg

The major purposes of this study were: to assemble factual information regarding the source, training and experience of supervisors; to ascertain the areas of supervisory responsibility which are seriously difficult for newly appointed supervisors and for experienced supervisors; and to identify sources and methods which provide sufficient training to those in supervisory positions.

Respondents in this study included 194 supervisors in agriculture and home economics, and 33 of their respective

administrators, in twenty-six states of the Southern and Western regions. Thirty-two areas of supervisory responsibility were identified for respondents to consider. The data were classified on the basis of age, sex and position, tenure in supervision, academic degrees, advanced academic studies and in-service training events, studies in social sciences and humanities, and supervisory job descriptions. Data were analyzed on the basis of percentage distribution and rank order responses.

Some of the Findings

Supervisors have been selected from Extension ranks after obtaining several years of experience in other Extension positions.

The thirty-two areas of responsibility are all essential parts of the supervisor's job. Responsibilities in the five areas of program evaluation, agent appraisal, establishing realistic objectives, determining real training needs, and counseling are seriously difficult for new supervisors. Eight other areas were identified as likely to be of serious difficulty to new supervisors. These thirteen most difficult areas for new supervisors tend to be related to Extension program development, agent appraisal and professional improvement.

Newly appointed men supervisors are apt to have more difficulty than women supervisors with responsibilities relating to the development of local leadership. Newly appointed women supervisors are apt to find more difficulty than men supervisors in dealing with county program planning, clarifying their own duties, and in dealing with county personnel problems.

Supervisors with over 2 1/2 years of tenure recognize more problem areas for new appointees than do supervisors with less tenure in supervision. Administrators generally agree with supervisors as to areas of difficulty to new supervisors, but they also believe additional areas to be of serious difficulty for them.

Special training for new supervisors is considered highly valuable on any aspect of their work. The areas considered most valuable for training are essentially the same ones in which new supervisors encounter the greatest difficulty. These generally deal with county programs, agent appraisal and professional improvement of both agents and supervisors.

Supervisors who had clearly defined and written job descriptions indicated considerably less frustration and difficulty than those without such job descriptions; especially in areas relating to understanding the administrative organization, policies, personnel management, organized plans of work, coordination of staff effort, reporting, and the understanding of their own duties as well as those of their fellow staff members.

Data analyzed on the basis of age, academic degrees, studies in social sciences and humanities, and advanced studies, indicated no relationship to supervisory performance.

Supervisors believe that the most helpful college courses and training methods are those focused directly on the supervisors' needs.

The thesis includes recommendations for induction training for newly appointed supervisors in the Cooperative Extension Service.

Microfilm \$2.50; Xerox \$7.80. 170 pages.

ADAPTATIONS OF THE EUROPEAN CORN BORER, *Pyrausta nubilalis* (Hubn.) FOR WINTER SURVIVAL.

(L. C. Card No. Mic 60-995)

William Hanec, Ph.D.

The University of Wisconsin, 1960

Supervisor: Professor Stanley D. Beck

The ability of the European corn borer, *Pyrausta nubilalis* (Hubn.), to adapt to the winter conditions of the northern parts of the corn belt has played an important role in its survival in this area. The borer's survival is dependent on at least two very important adaptations. One is the synchronization of its life cycle with the relatively short corn-growing season; the other is its ability to survive low winter temperatures as a mature larvae.

When borer larvae were reared on purified diets under controlled temperatures and photoperiods, the results showed that low temperatures alone did not induce diapause in the majority of the larvae. At a continuous rearing temperature of 15°C., only 23 per cent of the larvae entered diapause. At 20° and 23°C., 15 and 12 per cent, respectively entered diapause. At higher temperatures and in darkness diapause incidence was negligible.

However there was a direct effect of temperature and photoperiod on the induction of diapause. The most effective photoperiod range was between 10.5 and 13.5 hours at rearing temperatures of 20, 23, 26 and 29°C. Diapause incidence fell off abruptly under shorter or longer photoperiods at the higher rearing temperatures and tended to be inversely proportional to the temperature. Effective photoperiods induced diapause in the majority of larvae, even under high rearing temperatures. Oxygen consumption, fat content and water content were found to be poor criteria on which to separate diapause from non-diapause larvae.

Winter survival of mature borer larvae was found to be dependent on a prolonged period of cold-hardening brought about by the decreasing outdoor temperatures during late fall and early winter. Mature non-diapause borer larvae were severely injured at -10°C. even after one day of chilling. Mature larvae in diapause obtained from the field in late summer and fall succumbed very rapidly at -10°C. Cold-hardening of borer larvae began in August and continued at least up to late November. Cold-hardy winter larvae survived up to three months at -20°C., under dry chilling conditions. Chilling at -10, -15 and -20°C. in the presence of contact moisture caused freezing of the larvae and reduced their survival markedly. Despite the formation of ice in their tissues, cold-hardy larvae survived for several weeks while frozen at -20°C.

The undercooling temperature, as measured by means of a thermistor thermometer, of cold-susceptible larvae was lowered significantly by chilling and desiccation but survival in the cold was not significantly increased. Cold resistance was destroyed by warming cold-hardy larvae under either dry or wet conditions at 30°C.

The relationship of the undercooling temperature and survival of cold-hardy borer larvae at -10, -15 and -20°C. was also investigated. No significant correlation was found between the undercooling points of the larvae and their survival in the cold. On the contrary, mortality

occurred at random regardless of the undercooling temperatures. Microfilm \$2.50; Xerox \$6.00. 125 pages.

I: THE INFLUENCE OF BORON ON THE YIELD, GROWTH, AND STRUCTURE OF CORN.

II: THE BORON CONTENTS OF SOME WISCONSIN WATERS.

(L. C. Card No. Mic 60-998)

Toivo Heikkinen, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor K. C. Berger

A high incidence of blank stalks often occurs on some soils in corn fields with high plant population and high fertility. This condition occurs periodically varying with the season. Previous results indicated that low boron availability could be a cause of blank stalks and reduced yields on some of these fields. The present investigation was undertaken to determine to what extent low boron availability was the cause of the high blank stalk incidence.

Field studies were conducted at the Branch Experiment Station at Hancock and on various farms throughout Wisconsin for three consecutive years.

The trials at the Branch Experiment Station were located on a Plainfield sand having a relatively low available soil boron content. Various rates and kinds of boron materials were applied. An attempt was made to establish three levels of soil moisture with irrigation.

Experiments were also conducted on over 47 farms with widely varying soil types and available boron contents.

The data obtained from studies conducted at the Hancock Branch Experiment Station indicate that a lack of boron was not the cause of blank stalks or reduced yields of corn. In these experiments, a part of the field was leached to remove available soil boron by means of excessive irrigation. Plant growth and tissue analysis showed that available soil boron content was unchanged by leaching. Analysis of the irrigation water used showed this water to contain 0.50 parts per million of boron revealing a reason for high plant tissue content and lack of response.

Results from the 47 farm experiments showed that less than one-third of the fields had significant amounts of blank stalks (more than nine per cent). On these fields the application of borate fertilizers did not reduce the incidence of blank stalks nor increase yields significantly. In most cases of high blank stalk incidence, severe mid-season drought caused actual death of many corn plants.

Greenhouse studies were conducted in conjunction with Dr. Burdean E. Struckmeyer of the University of Wisconsin Horticulture Department to determine the injurious effects of boron deficiency on corn.

Corn plants were grown in nutrient solutions and three different levels (0.00, 0.03, and 0.25 ppm) of boron were maintained.

The histological examination results obtained showed that cellular disintegration occurred in both the tassel tips and ear branches when boron was absent from the nutrient solution. The histological examination results also showed that the supply of boron must be continuous

because absence of boron at early stages of growth resulted in severe tassel tip damage while absence of boron at later stages resulted in severe damage to both the tassel tip and ear branch.

The total boron contents of the upper leaves of corn plants grown in nutrient solutions were determined. Plants which did not receive boron for either four or six weeks and then were transferred to a solution containing 0.25 parts per million boron to maturity contained an equal amount of boron as those plants which received 0.25 parts per million boron during their entire growth period. Because the latter plants produced ears with normal kernel development while the former did not, it is clearly shown that the boron contents of the upper leaves of corn plants at time of harvest are not an indication of the availability of boron to the plants during their entire growth period.

Analysis of numerous waters throughout the state showed ground waters to be fairly high in boron content (0.32 to 1.18 parts per million); rivers waters to vary from 0.39 to 0.59 parts per million; lake waters to vary from 0.07 to 0.37 parts per million and rain water to have 0.00 parts per million boron.

Microfilm \$2.50; Xerox \$5.60. 101 pages.

A PEDOLOGICAL STUDY OF RED CLAY SOILS AND THEIR PARENT MATERIALS IN EASTERN WISCONSIN

(L. C. Card No. Mic 60-1001)

Merlin Edwin Horn, Ph.D.
The University of Wisconsin, 1960

Supervisor: Assistant Professor Gerhard Lee

The red clay region of eastern Wisconsin is characterized by reddish brown soils having a high content of clay. This area is a portion of the Valdres drift region and extends from Milwaukee, north along Lake Michigan to Sturgeon Bay, and west, encompassing the Fox, and Wolf River valleys.

A general investigation of the region, and detailed studies in Winnebago County have been carried out. Soil parent materials were characterized and a soil genesis study was made.

Soil parent materials consist of two main groups, namely, Valdres glacial till, and Valdres and post-Valdres glacio-lacustrine deposits. Valdres till varies widely in its composition due to differences in bedrock, older drift deposits, and in the capacity of the Valdres ice to admix these materials. Five different types of till parent materials have been recognized. The distribution and composition of these various types is usually closely related to the geographic distribution and nature of overridden deposits.

The most common type of till parent material consists of a reddish brown (5YR 5/3-4/4 Munsell colors) calcareous clay loam. The calcium carbonate equivalent ranges from 25-35%. This property is closely related to the content of dolomitic limestone which, as shown by pebble counts, composes 80-95% of the gravel fraction. The fine fraction (less than 2 mm. diameter) is frequently

composed of 60-80% silt and clay, incorporated when Valders ice advanced over sediments of Early Lake Oshkosh and Lake Chicago. A mineralogical study of the B horizon of a forest soil formed in red clay loam till has shown it to be high in illite and montmorillonite.

Besides this kind of till, four other types have been identified. One of these is a clay till, and another a sandy till. These represent the extremes of a lithologic series in which the five types intergrade in composition from one to another.

In western Winnebago County, glacial drift composed of light reddish brown loam to sandy loam till has been observed lying unconformably beneath Valders red clay till. The uppermost portion of this till has been leached somewhat and may represent a weathered zone developed prior to burial by Valders till. In a nearby area, not covered by Valders drift, patches of a similar till overlie grayish brown loam till presumed to be Cary.

The second most important group of soil parent materials are lacustrine deposits found in the Wolf and Fox River valleys, and in local areas near Green Bay, and Lake Michigan. Later Lake Oshkosh sediments in the Wolf River Valley are sandy, while those of the Fox Valley are high in clay. Lake Algonquin sediments tend to be silty.

Sediments of Later Lake Oshkosh are found at levels up to 780 feet above sea level in the Wolf River Valley, and up to 750-760 feet in the lower Fox Valley. The discontinuity in levels is believed a result of partial damming of outlet channels. Beach deposits found near 800 feet are assigned to an Early Lake Oshkosh origin.

Many soils of the red clay region are poly-lithogenetic, especially in the Wolf River lacustrine area, and in areas where thin Valders drift overlies Cary drift. Also, a thin layer of silty aeolian sediments covers much of the region.

Gray-Brown Podzolic soils and associated Humic-Gleys dominate the southern portion of the red clay region. A few small areas of Prairie soils are found on both till and lacustrine sediments.

In the northern portion of the region, and along Lake Michigan, a transitional zone exists between regions of Gray-Brown Podzolic soils and true Podzols. A cool moist climate and a subboreal natural forest have caused podzolization. High carbonate and clay contents in the parent materials have resisted the podzolization process with the result that "calcareous podzols," "incipient podzols," or Gray Wooded soil profiles have developed. Locally, bisequal sola have formed, in which the upper sequum is that of a Podzol, and the lower, that of a Gray-Wooded, or Gray-Brown Podzolic soil.

Microfilm \$3.45; Xerox \$12.15. 267 pages.

PROTECTION OF PLANTS FROM SOME APHID-TRANSMITTED VIRUSES

(L. C. Card No. Mic 60-1018)

Carl Harmon Shanks, Jr., Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor R. Keith Chapman

The reduction of aphid dissemination of viruses in vegetable crops by using insecticides and repellents was

studied under field conditions. Several contact and systemic insecticides, applied to the foliage or soil, gave good reduction of cucumber mosaic virus (CMV) infections in 1956, with a soil application of Thimet being especially effective. No similar treatments reduced bean mosaic (BMV) incidence in beans that year, probably because of a larger natural source of BMV than CMV in the area. Soil applications of Thimet gave a much smaller reduction of CMV in 1957 but Am. Cyanamid 12008, on the foliage, was nearly as effective as in 1956. Foliage sprays of repellents and contact or systemic aphicides and soil applications of systemics failed to reduce the spread of CMV in 1958, except for a mixture of Tabutrex (repellent) and parathion which showed some promise. However, several of these treatments reduced aster yellows virus (AYV) (leafhopper-transmitted) infections with the Tabutrex-parathion mixture and Bayer 25198 giving significant reduction. This was probably because leafhoppers need more time to transmit AYV than aphids for CMV so insecticides or repellents have longer to act before inoculation is accomplished.

The effects of insecticides on aphid behavior and virus transmission were studied in the greenhouse. Parathion on tobacco foliage caused aphids to make longer feeding probes than on untreated foliage during 5-minute test periods while DDT had an opposite effect. Neither material affected aphid acquisition of potato virus Y (PVY) but parathion decreased, and DDT increased, the number of inoculations made by aphids. Several insecticides, tested for speed of toxic action on *M. persicae*, required at least 1 1/2 hours to kill 90 per cent of *M. persicae* alatae, 2 hours after treatment, and much longer to kill 90 per cent, 3 days later. Aphids can easily both acquire and transmit non-persistent viruses in less than 1 1/2 hours. Winged *M. persicae* remained on parathion and Thimet-treated plants longer than on untreated foliage while DDT caused opposite results. Olfactometer experiments showed that parathion attracted aphids while DDT seemed to attract and then repel them. Further tests indicated viruliferous aphids were more attracted to parathion-treated than untreated tobacco plants with a consequent increase of PVY infections. Aphid dissemination of PVY within cages was greatly reduced by parathion applications to the infected plants.

Antiviral chemicals were tested against aphid-transmitted plant viruses in greenhouse experiments because such chemicals act differently on aphid and mechanically transmitted viruses. Sprays of cytovirin (5 ppm) gave 79 and 50 per cent reductions of PVY and CMV infections of tobacco, respectively, when the viruses were mechanically transmitted. Less reduction of PVY, and none of CMV, was obtained with 25 ppm when they were transmitted by aphids. Cytovin (25 ppm) had no effect on aphid-transmitted pea virus 2 (non-persistent) or cabbage virus B (CVB) (semi-persistent) infections, indicating the type of aphid transmission has no effect on cytovin activity. Potato virus X (synergistic with PVY) had no effect on, and wetting agents did not increase the effectiveness of, cytovin against aphid-transmitted PVY. Cytovin on PVY-infected foliage did not interfere with aphid acquisition of PVY and had no direct effect on PVY when fed to viruliferous aphids.

Trichothecin (10 or 20 ppm) reduced PVY infections of tobacco by about one-half when the virus was aphid-transmitted. It had no effect on CVB but reduced PEMV

infections by 42 per cent. A mixture of trichothecin and cytovirin (25 ppm each) stopped most PVY infections but was extremely phytotoxic. Milk and 8-azaguanine had no effect on aphid-transmitted PVY and CMV, respectively. Microfilm \$2.50; Xerox \$4.40. 81 pages.

THE ADSORPTION OF THE SODIUM SALT OF 2,4-D ON KAOLINITE, BENTONITE AND CELLULOSE.

(L. C. Card No. Mic 60-958)

Richard Russell Yeo, Ph.D.
University of Minnesota, 1959

Of several ways that herbicides are rendered inactive relatively little is known of the fundamentals of adsorption of herbicides onto soil particles. The adsorption of the sodium salt of 2,4-dichlorophenoxyacetic acid on bentonite, kaolinite and cellulose was studied. The objectives of the study included: (1) the determination of the concentration of 2,4-D needed to saturate each of the adsorbents and the quantity of 2,4-D adsorbed; (2) the influence of (a) period of contact and (b) drying of clays on adsorption; (3) the effect of adsorbed 2,4-D molecules on the expansion of the bentonite lattice; (4) the influence of replaceable aluminum of clays on the adsorption of 2,4-D; (5) the influence of leachings on adsorption and growth response; and (6) the influence of adsorbed 2,4-D on growth of flax seedlings.

To determine the adsorption of 2,4-D minute amounts were added to one-fourth gram samples of the adsorbents. The amounts of 2,4-D not adsorbed were removed by leaching with three aliquots of water. The leachates were evaporated to dryness and the residues analyzed for the quantity of 2,4-D present. The chromotropic acid method of analysis was used to determine the quantity of 2,4-D.

The maximum amounts of 2,4-D that were adsorbed on bentonite, kaolinite and cellulose after one minute of contact were 9.3, 27.2 and 1,680 micrograms, respectively. It is suggested that adsorption onto the clays is associated with the hydroxyl groups exposed on edges of the clay lattices. The total adsorption onto cellulose appeared to be the sum of that adsorbed by an electrostatic attraction and capillary forces.

Adsorption equilibria were attained when the 2,4-D was allowed to stand in contact with the clays for 2.3 and 2.8 hours. The amounts of 2,4-D adsorbed by each increased by 33.3% on bentonite and 12.8% on kaolinite. The method that was used was not applicable to cellulose.

Other studies indicated that drying clays after they had been hydrogenated influenced the amounts of 2,4-D that could be adsorbed on them. An X-ray diffraction photograph of bentonite saturated with 2,4-D showed a slight expansion of the lattice suggesting the 2,4-D molecules could be "trapped" within the lattice layers. Removing the replaceable aluminum from the clays and saturating them with 2,4-D indicated that replaceable aluminum was not responsible for the adsorption of 2,4-D.

When flax seeds were germinated on the adsorbents having 2,4-D adsorbed on them a stimulation of growth of the flax hypocotyls was noted. Leaching the adsorbents with water removed some of the adsorbed 2,4-D and, consequently, decreased the stimulative effect on the growth

of the flax hypocotyls. A growth curve resulted when flax seeds were germinated on cellulose samples having varying amounts of 2,4-D adsorbed on them. When 0.1 to 0.4 milligrams were adsorbed on one-fourth gram samples of cellulose maximum stimulations of growth of the hypocotyls occurred. When amounts greater than 0.9 milligrams were adsorbed inhibition of hypocotyl growth resulted. Microfilm \$2.50; Xerox \$3.00. 55 pages.

AGRICULTURE, ANIMAL CULTURE

SOME ASPECTS OF THE NUTRITION OF THE BABY PIG

(L. C. Card No. Mic 60-981)

John Malcolm Asplund, Ph.D.
The University of Wisconsin, 1960

Supervisors: Professor R. H. Grummer
Professor P. H. Phillips

Part I

Experiments were conducted with early weaned pigs and lactating sows to assess some effects of added fat in the rations of these two classes of swine.

The baby pig experiment involved 5 lots of 10 pigs averaging 18 pounds in weight. These pigs were fed rations containing 0, 6.5, 11.0 and 16.0 per cent tallow and 16.0 per cent corn oil. The ratio of protein to energy was held constant and the control ration was very palatable and adequate. There was no advantage in weight gain, feed efficiency or energy efficiency for the pigs fed tallow over those fed no added fat, while swine fed 16.0 per cent corn oil gained more slowly and less efficiently than the control group. Three individuals from each group were slaughtered after 7 weeks. Pigs from the groups fed fat had a lower carcass specific gravity, higher fat content of the shoulder, a greater depth of fatback and higher blood fat levels than did individuals from the control lot.

The digestibility of ether extract nitrogen was determined for 12 pigs 8 weeks of age using the chromic oxide dilution technique. The addition of 10 and 20 per cent white grease increased the digestibility of both ether extract and nitrogen in these trials.

Ten gilts were divided into 5 groups of two each and placed on experimental rations within 3 days after farrowing. The rations were as follows: low energy, no added fat; high energy, no added fat; 10 per cent tallow; 15 per cent tallow; and 20 per cent tallow. The sows were milked and blood samples taken when they were placed on the rations and at 3 and 7 weeks thereafter. No advantage in litter weight gain or litter weight gain plus sow weight gain, feed efficiency or energy efficiency could be demonstrated for those sows fed added fat. Blood fat levels were elevated in sows fed tallow. In general, the milk fat levels of sows fed no fat gradually declined, while those of the tallow-fed sows increased over a 7-week period. There was no difference between groups in the iodine number of the milk fat or body fat during the experimental period.

Part II

Experiments were undertaken in order to study some phenomena associated with the digestion and absorption of intact proteins in the new-born pig.

Baby pigs fed colostrum at delayed intervals after birth lost their ability to absorb γ -globulins at 21 to 30 hours post partum. Proteins labelled with fluorescent dyes were used in an attempt to demonstrate absorption and excretion of minute quantities of intact proteins. It was not possible to confirm the presence of the original material in either serum or urine.

Insulin produced hypoglycemia in baby pigs when injected intramuscularly or given orally. Oral doses of insulin were effective in lowering blood glucose for 18 to 24 hours after which the baby pigs lost the ability to absorb this material. Less than 10 per cent of the insulin was absorbed intact.

There was no measurable increase in gastric proteolytic activity at pH 1.8 or 3.85 in the stomach contents of baby pigs during the first 60 hours of life. The presence of rennin was demonstrated in the gastric mucosa of baby pigs. Both pepsin and rennin were found to be active in extracts from the gastric mucosa. The milk clotting activity of stomachs and stomach contents showed no positive relationship with each other during the first 12 to 60 hours of the baby pig's life.

Microfilm \$2.50; Xerox \$4.60. 89 pages.

AN ANALYSIS OF DAIRY SIRE EVALUATION METHODS IN ARTIFICIAL BREEDING

(L. C. Card No. Mic 60-957)

Clifford LaVar Wilcox, Ph.D.
University of Minnesota, 1959

Adviser: C. L. Cole

The first lactation records of 6,381 daughters of 98 Holstein sires serving in six artificial breeding organizations were studied to compare three methods of sire evaluation - the daughter average, daughter-herd average difference, and the contemporary comparison method. Three production characteristics, milk, butterfat, and four percent fat corrected milk form the basis for these evaluations.

Each of the three methods were compared on two measures: (1) the simple correlation coefficient computed between the average production of the first and second 10, the first and second 20, the first and second 40, and the first and second 80 daughters of each sire; and (2) the relative variance of each method.

On the basis of the correlation coefficients there is little choice between the three methods. Significance at the one or five percent level was obtained in each case where the average production of the first 20 daughters was correlated with the average production of the second 20 daughters and the number of sires was large enough to provide a reliable sample. This indicates that the production of the first 20 daughters will give a reliable estimate of the production of future daughters under the conditions of random mating and random distribution of daughters in patron herds in artificial breeding.

The relative variances 9.64, 11.48, and 13.26 were obtained for the daughter average, the daughter herd average difference, and the contemporary comparison method respectively.

It is concluded that the daughter average method is easily the first choice among the three methods studied, it has the lowest relative variance, it is easy to compute, and it makes use of all data. The daughter-herd average difference is second and the contemporary comparison third. The contemporary comparison method may be criticized in that it does not make use of single records.

A comparison was made between the production of the artificially sired daughters of young, partially proved, and naturally proved sires by each of the three methods studied. In each case the daughters of young and partially proved sires outproduced the daughters of proved sires.

Thirty three sires in the study had a natural service proof and production data on 20 or more artificially sired daughters. Rank correlation for all combinations of artificially sired daughters and naturally sired daughter production was computed. Significance at the five percent level was obtained in only one case.

Rank correlation for all combinations of the three methods studied was computed. Significance at the one percent level was obtained in each case.

It is concluded that progeny testing young sires in artificial breeding offers the best opportunity to make genetic improvement in the commercial herds in this country. A proposed progeny testing program is presented. Microfilm \$2.50; Xerox \$5.40. 107 pages.

AGRICULTURE, FORESTRY AND WILDLIFE

SOME PHASES OF THE EARLY LIFE HISTORY OF THE NORTHERN PIKE, *ESOX LUCIUS* L., WITH SPECIAL REFERENCE TO THE FACTORS INFLUENCING THE NUMERICAL STRENGTH OF YEAR CLASSES.

(L. C. Card No. Mic 60-966)

Donald Raymond Franklin, Ph.D.
University of Minnesota, 1959

Immigration of adult fish into the nursery slough took place between the hours of 8:00 p.m. and 2:00 a.m. at water temperatures between 34° and 40° F. Spawning occurred at water temperatures above 50° F. and density of egg deposition was variable, being highest in those areas of the slough where the temperature was highest. Some adults remained in the slough for periods as long as 71 to 107 days after spawning. The embryo period ranged from 11 to 15 days, being longest in a cooler-than-average year. Most embryo loss occurred before closure of the blastopore, which occurred about 80 hours after fertilization. Fertilization was nearly complete in all years, and embryo survival ranged from 64 to 90 percent. There was no evidence to indicate that mortality of embryos or post-larvae was associated with oxygen, total alkalinity, hydrogen sulfide, ammonia, or pH levels attained in the nursery slough. Direct causal mechanisms

were not established but both rate of water temperature change and the level of suspended iron could have directly influenced survival of pike.

At hatching, the fish ranged in length from 6.5 to 8 millimeters. The yolk sac is not yet completely absorbed when feeding begins at a length of 10.3-12.5 millimeters. Scalation begins at a length of about 32 millimeters, with the first scales forming immediately under and all along the lateral line. Growth in length was sigmoid, and in early growth the jaw and tail regions grow most rapidly, as compared to the body or the fish as a whole. There were separate length-weight regressions for the pro-larval and alevin-juvenile periods.

There was a general shift from microcrustacea to insects at a length of about 20 millimeters. The incidence of cannibalism was very low.

Fingerling escapement appeared to be conditioned by the attainment of a length of about 20 millimeters. Once begun, escapement is under the close control of illumination intensity, being greatest at high intensities. Escapement of juveniles extends into July if there is adequate water.

Survival from hatching to the alevin stage was observed to vary from 0.4 to 5.2 percent. Comparisons of the abundance of I-annulus fish in the various years indicate that the critical survival periods are concentrated in the period of slough life. The production of young appears to be independent of the number of spawning adults, and production of juveniles appears to determine the rank of the year class, with heavy alevin production acting chiefly to enhance or augment an already good year class.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

AGRICULTURE, PLANT CULTURE

VARIATION IN SEED AND SEEDLING CHARACTERS OF BROMEGRASS, BROMUS INERMIS LEYSS., IN RELATION TO ENVIRONMENT.

(L. C. Card No. Mic 60-977)

Majid Muhsen Al-Ansary, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor David Clyde Smith

Although brome-grass is widely adapted to the temperate regions, there is difficulty in obtaining satisfactory seedling establishment. Environmental factors such as soil type, fertility, available moisture, seeding depth, temperature, light and disease incidence have been investigated in regard to seedling stand and vigor in this and other grass species. There is, however, little information on the importance of varieties or seed lot, as factors related to stand establishment. This study was undertaken to investigate the extent and nature of variability in seed and seedling characters in smooth brome-grass with a view toward ascertaining the possibilities for improving the seedling establishment through breeding methods.

Five varieties, one synthetic and 65 individual plant

progenies were studied in a series of greenhouse experiments at Madison, Wisconsin. Six soils, three seeding depths and two levels of moisture and nitrogen were used to investigate possible interactions with seed lots. Data of interest included rate of emergence, maximum stand, height and vigor.

Trials indicated that soil type, seeding depth, soil moisture and nitrogen affect seedling stand and early vigor. The first two treatments caused significant variations only when other factors were limiting. Soils, nitrogen and moisture showed interactions with individual plant seed lots only. Varietal performances might be expected to be similar under widely varying soil, nitrogen and moisture conditions.

Varieties and individual plant progenies were found to differ in rate of emergence, maximum stand, height and vigor. Seed weight was not a serious factor in comparing varieties. Seed weight classes within a seed lot differed in subsequent seedling stand and vigor. However, certain progenies, similar in seed weight, were different in the factors of establishment, indicating that not all of the differences found among progenies can be ascribed to seed weight. Seed viability, seed care and age, seedling diseases and soil temperature were all found to affect stand and vigor.

Correlations among fifty individual plant progeny characteristics were investigated. Vigor was correlated with seed weight for each soil at each depth and at both levels of nitrogen. Stand was correlated with vigor in some soils and at some seeding depths. No significant correlations were obtained between seed weight and blotter germination or stand, and between blotter germination and stand or vigor. Seed weight, stand and vigor were independent of the nature and intensity of mother plant diseases. It would appear that a highly viable, undamaged, fresh seed lot would, on the average, produce a successful stand in the field since brome-grass performances under greenhouse and field conditions were found to be highly correlated.

The fifteen plant progenies selected and the synthetic variety were superior in germination and seedling vigor to the five commercial varieties tested. This indicates that improvement in seedling stand and vigor through breeding is possible.

Since seed viability, soil moisture, nitrogen and diseases were very important factors in determining seedling stand and vigor, it would seem both worthwhile and feasible to control these factors carefully when testing for seed and seedling characters during the course of the breeding program.

Microfilm \$2.50; Xerox \$5.60. 113 pages.

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE PHYTOTOXICITY AND DISSIPATION OF SIMAZIN

(L. C. Card No. Mic 60-911)

Orvin Charles Burnside, Ph.D.
University of Minnesota, 1959

Adviser: A. R. Schmid

Environmental factors influencing simazin phytotoxicity as well as the dissipation of simazin from the soil were studied.

Clintland oats, Flambeau soybeans, and single cross A502 x A556 corn were the three bioassay crops used to quantitatively determine the amount of simazin in Waukegan silt loam. The oats, soybeans, and corn were sensitive in the range of 0.25 to 1, 0.5 to 8, and 8 to 256 ppmw of simazin, respectively.

There was a wide margin of safety for the selective control of annual weeds in corn with simazin. Application rates of 2 and 4 pounds of simazin per acre significantly increased corn and decreased weed dry weight yields of above ground parts grown in Waukegan silt loam in a field experiment.

The response of eight field crops to simazin listed from most tolerant to most susceptible are as follows: single cross A502 x A556 corn, Norghum sorghum, Marine flax, Flambeau soybeans, Caribou rye, Selkirk wheat, Kindred barley, and Clintland oats.

Field applications of simazin used for selective weed control or even soil sterilization did not adversely effect the nitrification process or the over-all microbial activity in Waukegan silt loam as determined in laboratory experiments.

Organic matter and to a lesser extent clay content of a soil reduced simazin phytotoxicity as these soil components were increased. Therefore, one would have to use higher application rates of simazin on a muck than on a sandy soil to obtain equivalent weed control.

Adjusting the pH of Waukegan silt loam from 5.4 to 7.2 and 8.5 increased the toxicity of 8 ppmw of simazin to corn.

Increasing soil temperature, within limits, caused increased simazin toxicity to corn.

Conditions conducive to increased transpiration resulted in reduced simazin toxicity to corn.

Surface applications of simazin were leached into Waukegan silt loam by percolating water. The depth to which simazin moved was proportional to the amount of water applied. The maximum phytotoxicity of simazin applied to the soil surface was realized when the simazin was leached into the soil.

Simazin was removed from the Waukegan silt loam by soybean plants, and the extent of the removal was related to the length of time that soybeans were actively growing in the soil.

High temperatures (212 and 248° F.) and to a lesser extent low pH (pH 4) caused a significant deactivation of simazin in suspension. However, the very high temperatures necessary for this deactivation indicate that temperature would not be a significant factor in simazin deactivation in the field.

Deactivation of simazin occurred under conditions conducive to microorganism growth, but the rate of break-

down was fairly slow. The phytotoxicity of 4 ppmw of simazin in non-sterile Waukegan silt loam at field capacity was reduced 88 percent during 10 months of incubation at 85° F. No deactivation of simazin occurred in sterile or frozen soil.

Five microorganisms that were able to subsist for three months in a media containing simazin as the sole source of nitrogen and nearly sole source of carbon were isolated. However, they were not able to deactivate simazin in solution cultures during a 30 day incubation period. Microfilm \$2.50; Xerox \$5.60. 114 pages.

THE INHERITANCE OF MATURITY IN ZEA MAYS

(L. C. Card No. Mic 60-922)

Johan Giesbrecht, Ph.D.
University of Minnesota, 1959

Adviser: E. H. Rinke

This study was conducted in order to determine the manner of inheritance of maturity in corn, and to determine whether the backcross method of breeding could be used to combine the maturity of the early parent with the superior plant characters of the late parent.

The characters that were used as criteria of maturity were time of silking and time of pollen shedding. The progeny of two early by late corn crosses were used in this study. These were Mt42 x WF9 and V3 x B14. The individual plant data used for analysis were taken on the parental inbreds, their F₁, F₂ and the backcrosses to each parent.

The analysis of means indicated the existence of partial phenotypic dominance for earliness in both crosses. It also revealed the absence of transgressive segregation for earliness, and the presence of interallelic interaction of factors. A test for normalcy on the parental inbreds and their F₁ hybrids, revealed that in most cases the environmental variability did not fit the normal curve. Converting days to logarithms did not improve this fit. The lack of a fit to the normal curve was believed to have affected the accuracy of the results of the genetic investigations.

Heritability estimates were high for the V3 x B14 cross and very low for the Mt42 x WF9 cross. The lack of agreement between the hereditary behaviour of the two characters' days to silking and days to pollen shedding and the basic assumptions of the formula raise serious doubts as to the reliability of these estimates in the Mt42 x WF9 cross.

A genetic analysis of the characters days to silking and days to pollen shedding was made by the partitioning method. The results indicated that Mt42 and WF9 differed by four factors while V3 and B14 were differentiated by five factor pairs. The analysis also revealed that in both crosses the maturity factors were isodirectional and that therefore transgressive segregation for maturity did not occur.

Three generations of corn lines from each of these two crosses were studied in order to determine whether the maturity of the early parent could be recovered in the

progeny of the backcrosses to the late parent. The early lines recovered by this method would be expected to retain some of the plant characters of the late parent. The first generation consisted of ten lines from each of the following groups: $(B_1)S_1$, F_3 , $F_2 \times P_2$, $(B_2)S_1$ and $B_2 \times P_2$. The second and third generations were the result of self pollinating the earliest silking plants in each group.

The selfed progeny of the backcrosses to the late parent indicated that this method of breeding for improved early maturing corn lines has possibilities of succeeding. In one of the $(B_2 \times P_2)S_2$ lines, which originated from a double backcross to the late parent in the Mt42 x WF9 cross, the early maturity of the early parent was completely recovered. The $(B_2)S_3$ lines of this cross and the $(B_2)S_3$ and $(B_2 \times P_2)S_2$ lines of the V3 x B14 cross the maturity of the early parent was not completely recovered. However, the high variances in all of these populations indicated that in future generations the possibilities would be good for the complete recovery of the maturity of the early parent. Microfilm \$2.50; Xerox \$5.40. 106 pages.

QUANTITATIVE EPISTATIC GENE ACTION IN MAIZE (ZEA MAYS, L.).

(L. C. Card No. Mic 59-6777)

George William Gorsline, Ph.D.
The Pennsylvania State University, 1959

Since there has been no agreement on an adequate explanation of heterosis, studies on the gene action involved in heterosis should contribute needed information. Additional knowledge along these lines will prove valuable in planning future fundamental studies, in practical breeding efforts, and in interpreting maize inbred and hybrid performance experiments under diverse environments.

Six experiments encompassing three locations and two years were conducted employing the Bauman test for epistatic (non-allelic) gene action. In this test the mean of two entities crossed with an inbred tester is compared with the cross of the two entities crossed with the same inbred tester. A series of three double cross hybrids and two double-double cross hybrids were tested for epistasis with two testers in 1957, while a series of six single cross hybrids, six double cross hybrids, and one double-double cross hybrid were similarly tested for epistasis with three inbred testers in 1958. The materials under test for epistatic gene action were a complete sample of the 400 to 600 standard NE and AES maturity class hybrids of Pennsylvania breeding in addition to one 700 maturity hybrid of Ohio breeding.

Epistatic gene action was measured for ten characters: per cent bloom on an arbitrary day, per cent grain moisture at harvest, grain yield, per cent strong stalks at harvest by the push method, plant height, ear node height, per cent ear node height, ear length, ear diameter, and ear length-diameter ratio. Possible cytoplasmic and/or maternal effects were ignored.

The theoretical validity of the Bauman test was established for positive qualitative conclusions regarding the presence of epistatic gene action. Conclusions pertaining to absence of, or to a quantitative estimate of, epistatic gene action were not justified because of the limiting action

of linkage, tester genotype, canceling effects, and pseudo-negative effects. Possible differential genotype selection in the segregating generations was, with reason, ignored.

Data were presented, which agree with studies by other authors, that show the widespread occurrence of detectable epistatic gene action for measures of maturity, grain yield, stalk quality, plant and ear node height, and ear measurements. Measurable epistatic gene action was found in single cross, double cross, and double-double cross hybrids for all characters.

The effect of tester genotype on the efficiency of detection of non-allelic gene interaction by the Bauman test was confirmed. The theoretically important interactions involving environments with epistatic gene action as a portion of specific combining ability were confirmed.

The effect of epistasis on testing new hybrids and evaluating inbreds in top cross experiments was discussed. Diverse locations and years were found to be necessary for hybrid evaluation as a result of the commonly found Epistasis X Environments interactions for all characters in single cross, double cross, and double-double cross hybrids. It was found that the use of wide genetic base hybrids as tester parents in top cross experiments would measure epistatic gene action as well as general combining ability, thus complicating inbred evaluation.

It was concluded that epistatic (non-allelic) gene action is of general importance in maize performance.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

BORON UTILIZATION BY RED BEETS (Beta vulgaris L.).

(L. C. Card No. Mic 60-1005)

John Francis Kelly, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Warren H. Gabelman

A wide range of variability in the response to low levels of available boron exists between varieties and strains of table beets. In 1957 and 1958, sixty-eight varieties and strains were observed in the field on boron-deficient soils at several locations in Wisconsin. In 1957 a range of 0 to 76 per cent of the roots in the various strains exhibited boron deficiency symptoms as evidenced by black rot. In 1958 the range was 1.7 to 64 per cent. Using growing point necrosis as the index of boron deficiency, the same varieties and strains did not differ significantly during the seedling stage in their response to low levels of boron in nutrient cultures. Broad differences in seedling vigor may be responsible for differences in response of seedling and mature beets to low levels of boron. Treatment of beet seed with 0.075M boric acid slightly decreased germination and prevented the development of boron deficiency symptoms during the early growth of seedlings. However, differences in the native boron content of seeds does not effect any differences in growth of seedlings in boron-deficient media.

Less severe boron deficiency symptoms were exhibited by varieties and strains which accumulated the highest total concentrations of boron in mature leaf tissue in 1957.

Total accumulation of boron in young leaves of seedling or mature beet plants was not significantly correlated with the incidence of boron deficiency symptoms in 1958.

The relationship between boron deficiency symptoms and accumulation of boron, calcium, magnesium, potassium, sodium and phosphorus in young leaf tissue of twenty-five varieties and strains was studied in 1958. Boron deficiency did not affect the cation content of leaf tissue within a variety or strain. The varieties and strains least tolerant of low boron levels tended to accumulate the largest amounts of calcium in young leaf tissue. High calcium levels apparently result in increased severity of boron deficiency symptoms. Significant differences in the magnesium concentration in young leaf tissue were observed between several varieties and strains. Although the extreme tolerant and intolerant varieties tended also toward extremes in relative concentrations of sodium, potassium and phosphorus, there were no significant differences when several varieties and strains were compared. At least two types of tolerance to low boron levels are evident, one of which exists in plants with low levels of calcium and magnesium and the other which is present in plants containing high concentrations of these divalent cations.

The existence of a wide and continuous range of boron tolerance and mineral content in the varieties and strains studied indicates that several genes or gene complexes govern the expression of these characteristics.

Several organic and inorganic solvents were used to extract boron from dried leaf tissue. Weak hydrochloric acid was the most efficient solvent used, probably due to its hydrolytic action. Because of the instability of boron complexes, none of them could be separated by standard methods of extraction and chromatography.

The importance of using plant material of similar origin in individual genetic and physiological studies is discussed. It is proposed that, by using genetic variants exhibiting a wide range of response with respect to given physiological processes and holding the environment constant, the nature of these processes can be elucidated. The role of natural selection in the development of a wide range of low-boron tolerance in red beets is discussed.

Microfilm \$2.50; Xerox \$5.40. 110 pages.

THE INFLUENCE OF HARVEST MANAGEMENT ON YIELDS AND FOOD RESERVE TRENDS IN ALFALFA GROWN IN PURE STANDS AND IN GRASS MIXTURES

(L. C. Card No. Mic 60-1008)

Cyril A. Kust, Ph.D.

The University of Wisconsin, 1960

Supervisor: Professor Dale Smith

The effects of frequency of cutting and of fall cutting on Vernal alfalfa and the effects of frequency and height of cutting on Vernal alfalfa-timothy and Vernal alfalfa-bromegrass mixtures were studied during 1956 and 1957 and during the spring of 1958 at Madison, Wisconsin. The trends of reserve carbohydrate storage and utilization in alfalfa, timothy, and bromegrass under several

systems of cutting were followed from early spring to late fall during 1958.

The yields of hay from alfalfa were reduced significantly in all years when 4, 5, or 6 rather than 3 cuttings were made in 1956 and 1957 prior to September 1. There was a decrease in yield with each increase in the frequency of cutting. There was no effect on the yield of hay as a result of the height to which the plants had been cut (1 inch or 3 inches).

Alfalfa hay yields were not reduced in 1956, but were reduced significantly in 1957 and in the spring harvest of 1958, when the plants were cut in early October after having been cut either 2 or 3 times prior to September 1. There was no difference in hay yield in either 1956 or 1957 if the plants were not cut in early fall but the spring yield in 1958 was slightly greater from the plots that had been cut only 2 times in 1956 and 1957.

The yields of protein from alfalfa generally were not affected by the frequency of cutting in 1956 but were increased by fall cutting. However, the yields in 1957 were reduced by fall cutting and by cutting more (4, 5, or 6) or less (2) than 3 times prior to September 1.

There was a close relationship between the amount of available carbohydrates present in the storage organs of alfalfa in the fall and the yield of hay obtained from the plants in the subsequent year. The level of total available carbohydrates as of mid-November was reduced by fall cutting and by cutting more frequently than 3 times per year. The plants with a low level of reserve carbohydrates were more susceptible to winter injury and winter killing and produced less hay during the following year.

The trend of storage and utilization of reserve carbohydrates during regrowth following cutting differed somewhat among alfalfa, timothy, and bromegrass. In alfalfa, the per cent of total available carbohydrates in the storage organs decreased as regrowth began, regardless of the stage of maturity of the plants when cut. A minimum level was reached 15 to 30 days after the initiation of growth. The level then increased steadily and reached a maximum when the plants were in 1/10 to full bloom. When alfalfa was cut 2 times per year at near full bloom or 3 times per year at near 1/10 bloom prior to September 1, the reduction in the level of total available carbohydrates in the storage organs during early regrowth was less after each successive cutting.

The trends of reserve carbohydrate storage and utilization in timothy and bromegrass, following cutting in the spring, differed according to the stage of maturity of the plants when they were cut. When timothy and bromegrass were cut in a young, leafy stage, the level of total available carbohydrates in the storage organs did not decrease but continued to increase during regrowth and reached a maximum in timothy when the plants were mature and in bromegrass when the plants were in early head. When the plants were cut in boot stage or when further advanced in maturity, the level of total available carbohydrates decreased until the plants were about 6 inches tall and then increased steadily until the timothy plants were mature and the bromegrass plants were in early head. Microfilm \$2.50; Xerox \$5.40. 108 pages.

**FIRE BLIGHT CONTROL WITH STREPTOMYCIN
AS INFLUENCED BY TEMPERATURE
AND OTHER ENVIRONMENTAL FACTORS,
AND BY ADJUVANTS ADDED TO SPRAYS.**

(L. C. Card No. Mic 60-883)

Norman Siegfried Luepschen, Ph.D.
Cornell University, 1960

The influence of temperature on the growth of *Erwinia amylovora* in nutrient broth cultures was determined by turbidimetric measurements. The optimum temperature for the fire blight pathogen was found to be 24°C, with greatly reduced growth occurring below 21° and over 30°. The action of streptomycin *in vitro*, using the disc-diffusion technique, against *E. amylovora* is greater at temperatures diverging in both directions from the optimum for growth. In broth cultures streptomycin exhibited antibacterial properties over a range of temperatures, but was completely lethal to the bacterial populations only at temperatures below 18°.

Studies were made in constant environment chambers and under controlled temperatures in greenhouses with potted dwarf pear trees. Blossom blight control was substantial with protective streptomycin sprays before inoculation and with a 24-hour post-inoculation spray, at different application temperatures ranging from 60 to 70°F. In a comparison with 2-6-100 Bordeaux mixture, a streptomycin spray of 100 ppm proved to be superior in blight control, especially under lower temperature conditions. Simulated rain applied 30 hours after blossoms were sprayed with streptomycin reduced blight control by one-third.

Studies were made with young apple and pear trees to find suitable adjuvants that would increase streptomycin penetration as evidenced by blight control. Adjuvants tested were glycerol, Tween 20, Tritons B-1956, X-114, and X-45, boron, dextrose, and sodium chloride. The addition of glycerol or Triton B-1956 appeared the most promising. A 0.5 per cent spray of glycerol alone reduced shoot blight although tests showed this material has no antibacterial properties *in vitro*. It is felt that a mixture of compatible adjuvants that have demonstrated penetration properties when added singly, might be incorporated with streptomycin spray solutions to control fire blight more efficiently and with lower concentrations of the antibiotic.

Field control of pear blossom blight with 2 and 3 spray applications at 100 ppm was excellent in a Bosc and Gorham pear orchard. At the same time control in a Clapp's Favorite pear orchard, where 2 sprays were applied with a speed sprayer at 2 X concentration, was not significant. Detailed records of weather conditions and bloom periods suggest that streptomycin spray absorption is not adversely affected when sprays are applied in cool temperatures. The timing of such sprays and the method of application seem to be important factors in influencing effectiveness.

Considering environmental factors which may influence fire blight control with streptomycin, it is felt that high relative humidity is of greater importance than temperature in facilitating cuticular penetration. A moist atmosphere favors cuticle hydration which enhances permeation of the cuticle barrier.

Streptomycin nitrate and streptomycin pectate were

compared to the sulfate form in controlling fire blight. The nitrate form proved slightly superior to the sulfate in controlling blossom blight, while the pectate form was no more effective than streptomycin sulfate in controlling apple shoot blight.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

**EFFECT OF NITROGEN FERTILIZATION
ON YIELD AND NITROGEN CONTENT
OF FORAGE SORGHUM VARIETIES**

(L. C. Card No. Mic 60-887)

Asharfi Ram, Ph.D.
Cornell University, 1960

Introduction

Sorghums constitute an important crop in many parts of the world, including the United States of America. This crop has gained added importance recently due to successful breeding work resulting in the production of improved sorghum varieties and hybrids possessing desirable qualities like early maturity, disease resistance, palatable seed, low prussic acid content and high feeding value.

Sorghums, like other non-legume forages, require an abundance of nitrogen for high production, especially forage production. It is important, therefore, that the right time and rate of the nitrogen application be determined for sorghum varieties.

The investigation was, therefore, planned with a view to determine the comparative efficiency of two sorghum varieties with regard to their response to different rates and times of nitrogen application, and to estimate the amount of nitrogen taken up by sorghum plants at various stages of growth.

Procedure

The study was conducted in the greenhouse at Cornell University, during the growing season of 1959. The soil chosen was low in organic matter and nitrogen. Phosphate and potash were added to the soil at the rate of 100 pounds per acre each. One- and three-gallon glazed pots were used for growing sorghum plants. The nitrogen carrier chosen was urea and the varieties of forage sorghum were Black Amber and Leoti.

The layout of the experiment was split plot factorial design in which the fertilizer treatments included four nitrogen rates 0, 75, 150, and 225 pounds per acre applied at planting, in split (50% at planting and 50% at 35 days after planting) applications and at 35 days after planting. Four replications were used thus making a total of 96 pots in the experiment.

Samples were taken for height measurements, tiller counting, and for the determination of dry matter and nitrogen yields of forage sorghums at 20, 40, 60, 80, and 97 days after planting.

Results and Conclusions

The following major observations and findings were made:

1. The nitrogen treatments hastened the heading time of the sorghum plant - the higher the rates of application, the earlier the heading time.

2. The plants which did not receive any nitrogen at planting time, tillered profusely after they received nitrogen at 35 days after planting.

3. The treatments with 225 pounds of nitrogen per acre applied at planting or the treatments with 225 or 150 pounds of nitrogen per acre in split applications resulted in maximum growth in terms of heights.

4. The 225-pound rate of nitrogen per acre either at planting or in split applications produced the maximum dry matter.

5. Heavy rates of nitrogen either in split or later applications resulted in forage with a high percentage of nitrogen.

Based upon the above observations and findings, the following broad conclusions may be drawn:

1. The treatments in which there was some applied nitrogen at planting followed by sufficient nitrogen applied at later stage of growth resulted in optimum production of dry matter and nitrogen content. The need and amount of nitrogen as an initial application would, however, depend on the fertility status of the soil. The advisability of applying the major portion of the nitrogen at a later stage of plant growth would depend on the expected moisture availability in the soil at that period.

2. To confirm the above observations and findings, the study should be continued for a long time, preferably under field conditions.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

THE DETERMINATION OF ACIDITY IN OHIO SOILS BY USING LIME ADDITION, BASE TITRATION, AND BUFFER EQUILIBRATION METHODS.

(L. C. Card No. Mic 60-1213)

Harold Earl Shoemaker, Ph.D.
The Ohio State University, 1959

The first part of this study was made to ascertain why lime recommendations determined by the p-nitrophenol (Woodruff) and other buffer methods were not sufficiently accurate for some Ohio soils, particularly those from the northeastern part of the state.

Fifteen soils were sampled from various parts of Ohio. Calcium carbonate was applied to these soils in two-ton increments from 0 to 14 tons per acre. Distilled water was added as needed to bring the moisture level of the soils near field capacity. Periodically the soils were allowed to dry and the pH determined.

After 17 months of moist incubation and three months of dry storage, the pH was again determined. The actual lime requirement was taken as the amount of lime required to bring the soil to pH 6.8. Several other analyses were also made.

The triethanolamine, or TEA, buffer method did not measure the total acidity of the soils in this study. The amount of aluminum extracted with 1.0 N NH_4OAc at pH 4.8 approximated the amount of acidity not measured by the TEA method.

Since in liming practice the pH of soils is brought only to about pH 6.8, it was necessary to adjust the values obtained by the regular TEA method, i.e., at pH 8.1, to values at pH 6.8. The sum of the acidity measured by this adjusted TEA method and the amount of aluminum extracted at pH 4.8 approximated the total acidity (lime requirement) of these Ohio soils.

"Latent" acidity seemed to be caused in part by aluminum which was not measured by the methods used to determine the lime requirement.

The soil cation exchange capacity as computed by the addition of the total acidity to the total bases increased with an increased rate of liming. The soil cation exchange capacity was more constant with lime level when computed as the sum of the extractable Al (pH 4.8), the exchange acidity by the adjusted TEA method, and the total bases.

The purpose of the second part of this study was to devise an improved buffer method which would more accurately indicate the amount of lime needed on north-eastern Ohio soils as well as those from other parts of the state.

The lime requirements determined by two buffer methods were compared with the actual lime requirement as determined by the CaCO_3 incubation studies.

The p-nitrophenol buffer method (Woodruff) did not indicate sufficient amounts of lime for many Ohio soils. The reason seemed to be that the buffer was too concentrated for the acid neutralized by the buffer in these soils.

A new buffer method was developed which more nearly indicated the amount of lime required for Ohio soils and which increased the accuracy of determination over a greater lime requirement range. The method makes use of a mixture of triethanolamine and p-nitrophenol buffers in an appropriate procedure developed for its use.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

THE NATURE OF THE MALEIC HYDRAZIDE INHIBITION AND ITS RELATION TO AUXIN PROCESSES

(L. C. Card No. Mic 60-1021)

Raymond Brierly Taylorson, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor LeRoy Holm

The first phase of this study was concerned with the effect of fall treatments of maleic hydrazide on the levels of endogenous stimulators and inhibitors found in the acid fraction of ether extracts of lyophilized bud samples of *Rosa rugosa* taken over the course of the dormant period and during the initial phases of active growth from plants held in the field and storage. Such treatments of maleic hydrazide were found to inhibit subsequent sprouting at the termination of the dormant period. No effect could be found on the levels of the two stimulating substances and one inhibitor in the buds, which could account for the inhibitory activity of the maleic hydrazide. One of the stimulators was presumed to be indole acetic acid.

The second phase was directed toward an explanation of interaction phenomena found in systems undergoing cell enlargement in the presence of maleic hydrazide and

auxins. Maleic hydrazide was found to reduce the stimulatory influence of low concentrations of auxins on the elongation of Avena coleoptiles and water uptake in potato discs. Higher concentrations of auxins could overcome this inhibitory action of maleic hydrazide in Avena coleoptiles, while this treatment was only partially effective with potato discs. It was found that by pretreating the potato discs with auxins and then transferring them to inhibitory levels of MH for a final incubation, maleic hydrazide was no longer able to overcome the stimulatory action of NAA that had occurred during the pretreatment period. Pretreating the discs with maleic hydrazide, however, prevented any subsequent stimulatory action of NAA in the final incubation period. These studies show that the initial action of auxin on the enlargement of cell walls is profoundly affected by MH. Utilizing radioactive maleic hydrazide, it was found that some of the chemical becomes affixed to a fraction of cellular solids obtained on grinding and centrifuging the discs.

A study was made of the effect of maleic hydrazide on the stimulation of protein synthesis induced by auxins during the early stages of cell enlargement. No positive conclusions could be reached.

Interaction phenomena could also be demonstrated *in vivo* in etiolated whole and decapitated pea seedlings.

Microfilm \$2.50; Xerox \$5.60. 115 pages.

**HOST-PARASITE RELATIONSHIP OF
XIPHINEMA AMERICANUM COBB, 1913,
ON APPLE, CORN, AND STRAWBERRY.**

(L. C. Card No. Mic 60-1029)

Lyle Vernon White, Ph.D.
The University of Wisconsin, 1960

Supervisors: Professors H. M. Darling and G. Thorne

This study deals with (1) the pathogenicity of *Xiphinema americanum* to apple, corn, and strawberry, and (2) a histological study on the nature of root injury.

Large populations of *Xiphinema americanum* were found in association with declining stands of strawberry, corn, and apple in Wisconsin. *Xiphinema americanum* was shown by greenhouse experiments and histological studies to incite root damage and top symptoms similar to those exhibited by plants in early stages of decline.

Histological studies revealed the nematode penetrates the epidermis and cortex of young feeder roots 4 to 5 cells in depth with a subsequent collapse of cortical tissue. This results in a darkened root system and a sloughing of the cortex of strawberry and apple roots. Secondary organisms often are associated with darkened roots. A second type of injury to strawberry was evidenced by lesions 2 to 3 cells in diameter and extending 350 to 400 microns through the cortex.

Injury to corn roots is characterized by larger black lesions often extending to the endodermis. Feeding on root tips and actively growing regions of the roots of all three hosts resulted in root systems almost devoid of secondary rootlets. Microfilm \$2.50; Xerox \$3.00. 44 pages.

AGRICULTURE, PLANT PATHOLOGY

**THE AMINO ACID COMPOSITION OF
TWO STRAINS OF POTATO VIRUS X**

(L. C. Card No. Mic 60-1019)

John Gordon Shaw, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Russell H. Larson

For many years, biological and serological tests have been accepted as the criteria for determining strain relationships among plant viruses. With the notable exception of those of the tobacco mosaic virus, the strains of very few viruses have been compared physically and chemically. Since the investigations on tobacco mosaic virus have uncovered interesting differences in the amino acid compositions of several strains, two biologically and serologically distinct strains of potato virus X were analyzed in an effort to determine whether similar relationships exist.

Purified, non-aggregated samples of the ringspot and yellow strains of potato virus X were subjected to acid hydrolysis and their amino acid contents determined by ion-exchange chromatography. Tryptophan was measured by N-bromosuccinimide cleavage of the virus protein. Assuming the virus to contain about 6% ribonucleic acid, 96-97% of the amino acids were recovered and their concentrations in each strain calculated.

No qualitative differences were observed between the amino acid compositions of the two strains. Within the limits of experimental error, quantitative differences of the order of 10 to 25% were detected between the amounts of aspartic acid, proline, arginine, methionine, phenylalanine, and tryptophan. The yellow strain appeared to contain twice as much tyrosine as the ringspot strain. Cystine was not detected in the hydrolyzates of either strain.

On the basis of 74,000 as the molecular weight of a single sub-unit of potato virus X, the number of residues of each amino acid per sub-unit were calculated for each strain. Each sub-unit of potato virus X contains over 600 amino acid residues. Both strains contain less than 10 residues of histidine, tyrosine, and phenylalanine but almost 100 residues of alanine per sub-unit. Alanine, which comprises about 15% of the number of amino acid residues in the virus protein, may contribute to the great tendency of potato virus X to aggregate during purification procedures.

The quantitative differences between the amino acids of the two strains, while not sufficient to suggest a lack of relationship, involved enough amino acids so that it was impossible to ascertain the respective origins of the strains or to relate the differences in symptom production to any specific difference in the amino acid compositions.

Though not of immediate use, reconstitution, recombination, amino acid analyses, and nucleotide sequence determinations are discussed as theoretical criteria for establishing virus strain relationships.

Microfilm \$2.50; Xerox \$3.00. 38 pages.

ANATOMY

AN ELECTRON MICROSCOPIC STUDY OF SMOOTH MUSCLE

(L. C. Card No. Mic 60-1077)

Jona Carl Thaemert, Ph.D.
University of Colorado, 1959

Supervisor: Assistant Professor Verne L. van Breemen

Whether or not protoplasmic continuity occurs between smooth muscle cells has been a subject of controversy. Considerable doubt remains concerning the nature of free nerve endings in smooth muscle. Knowledge of intercellular adherence in smooth muscle tissue is very meager. The purpose of the present study was to attempt a clarification of these problems. This investigation was also concerned with the general features of smooth muscle from the gastrointestinal tract of rats, which were compared to findings in previous electron microscopic studies of smooth muscle.

It has previously been demonstrated that chilling reduces enzyme activity and therefore reduces autolysis. To assist in the preservation of delicate structures, hypothermia was used in preparing rats for excision of tissues. The tissues were fixed in buffered osmium tetroxide, dehydrated in methanol, embedded in methacrylate, sectioned with a Servall "Porter-Blum" microtome and studied with a Philips electron microscope.

Protoplasmic anastomoses were found to occur between smooth muscle cells of the gastrointestinal tracts and arterioles. These connecting structures have been called intercellular bridges, which is adequately descriptive if emphasis is placed on the interpretation that they represent protoplasmic anastomoses. In some cellular connections, transverse diffuse lines are seen. These may be interpreted as either disintegrating or reforming plasma membranes which is consistent with the concept that protoplasmic continuity is transitory.

Nerve endings were found to occur in the intercellular spaces between smooth muscle cells. Their structure conforms to the description of nerve endings in the neuromuscular junctions of skeletal muscle, and to the descrip-

tion of nerve endings in the central nervous system and autonomic ganglia. These nerve endings have been seen to lie in close contact with the plasma membranes of smooth muscle cells and it is concluded that these relationships constitute functional neuromuscular junctions.

The dense thickenings of the plasma membranes of smooth muscle cells and the collagen fibrils assumed to be attached to them, are considered to function in intercellular adherence. Smooth muscle cells exhibit profiles of protrusions which seem to occur as knobs, spikes, ridges and bulbous swellings. They are most often seen protruding into the intercellular space between cells which are widely separated. Here they occur singly or in groups, originating from one or more cells. Protrusions also occur on muscle cells which are in close contact. In this case they may protrude into pockets provided by the surfaces of adjacent cells. This is believed to serve as a means for intercellular adherence. Dense thickenings of the plasma membranes at the end of some protrusions and the confronted plasma membranes of adjacent cells may constitute situations which are similar to those reported for desmosomes. They may form points of firm intercellular adhesion. Protrusions of opposed smooth muscle cells have been seen to project toward each other, some in contact, others distinctly apart. This implies that they function in the formation of intercellular bridges. Other protrusions were found to extend toward and to lie in close contact with nerve endings. This suggests that protrusions are important in the formation of synaptic contacts. These findings and the implications of other studies have led to the concept that living smooth muscle cell surfaces are active.

The general features of the smooth muscle observed in this study agree essentially with findings of earlier electron microscopic studies of smooth muscle from other organs and animals. An extensive array of granular endoplasmic reticulum and unattached granules in the sarcoplasm of smooth muscle cells of young rats was described and compared with similar studies. This suggests that these cells are active in differentiation and protein synthesis.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

ANTHROPOLOGY

THE STRUCTURE OF KANURI SOCIETY

(L. C. Card No. Mic 60-986)

Ronald Cohen, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor M. L. Barnett

The Problem

The research was originally designed to uncover the nature and trend of socio-economic change among the Kanuri, a Muslim Emirate of Bornu Province in north-eastern Nigeria. Since the society has not been documented before in the anthropological literature a more fundamental problem has arisen. This is to describe the social matrix within which socio-economic change operates. The result is a descriptive study of the structure of Kanuri social life, which then provides a basis for the analysis of the major features of change and potential change present in the society.

Field work was carried out among the Kanuri from January 1956 to August 1957. The author learned the language and lived for a large part of the time in Magumeri, a middle sized district capital, forty miles from the capital of the Province. Side trips to other areas were made throughout, and the last three months were spent in the capital gathering documentary material and interviewing people in and around the court of the Shehu (Emir) of Bornu. Traditional techniques of participant observation were used throughout the field research. These were augmented by surveys on kinship behaviour norms, economic questions on consumption and production among a sample of cultivators in three towns, constructed annual income/expenditure data for twenty-two households in Magumeri, marriage choices among tribes and occupational preferences of school boys in the capital.

The data are presented in three parts. Part I gives the geographical and historical framework, Part II describes the nature of interpersonal relations, and Part III discusses the wider scaled structural features of stratification, political and economic organization in the society as a whole. Relevant changes which have occurred and are taking place are considered along with the above description and analysis. The last chapter summarizes the findings and discusses their implications.

Results and Conclusions

The traditional background from which the present society obtains its roots has been altered by contact with British colonialism. Village Heads within each district were appointed because of hereditary claims to the position, while District Heads were chosen because of their relation to the monarch. This set up possible conflicts between District Heads and Village Heads which has lasted until the present day. The colonial period has seen a steady growth in export/import trade handled by European Companies. This has introduced new wants in consumer

goods and encouraged the production of cash cropping. The requirements of modern government have brought other western educated Nigerians into Bornu and is stimulating the recognition of western education as a means of upward mobility.

Interpersonal relations among the Kanuri can be seen operating within the normative patterns set by the behaviour norms of kinship. The mutual expectations accompanying these norms are the "warp and woof" of Kanuri interpersonal relations. This is especially true of the *bèrzum* (discipline-respect) relationship. Kanuri society is hierarchical and feudal and in order to accomplish many of the necessary tasks of social life, sets of social relations are arranged into chains of superior/subordinate relations. The rules governing behaviour within these relations are encompassed within the norms of *bèrzum*, and thus this particular set of mutual obligation is of central importance to the perpetuation of the society in its present form.

Social stratification in Bornu is a function of ethnic membership, occupation, birth, wealth and rural or urban status. Lower and higher statuses are generally coordinated into two broad segments or classes. These segments are characterized by many cultural features and this creates the possibility of simulation of upper class membership by upwardly aspiring lower class individuals. The emphasis placed on non-self employment among high status positions indicates that western education means most desirably a civil service career rather than an entrepreneurial occupation.

Any local residence group in Bornu is potentially a larger political unit. This unit resembles an extended family organization. If the extended household organization head can maintain the subordination of his followers he may found an expanding political unit. The state as a whole is not a simple pyramid of power and authority. The civil service, the British, and the traditional factions, all tend to break up the unity of the state, although informal mechanisms of integration have developed which tend to partially offset the conflicts in the system.

It is estimated that the average four person family requires in the neighbourhood of \$180.00 to maintain its cultural "norms of living" per year. Since almost all families are engaged in subsistence activities this figure does not represent cash income, but rather the value of necessary material and services. Rising incomes have started to stimulate new wants and it is concluded that evaluative standards of living are expanding. Production in Bornu is a function of (1) the environment which allows most cultivators to have another occupation besides farming, (2) the differentiation of labour and the high divorce rate which makes labour sources unstable, and (3) political relations which may vary a cultivator's access to land. Trade is an occupation among others and is organized within the framework of the extended household organization with the household head financing and directing the trade of subordinates. It has also been organized more

recently into commodity defined relations, but this is still not very widespread. It is concluded that this present system will continue as long as there is a need for multitudes of middlemen to break bulk. Only when the population as a whole can afford to buy more consumption items will there be a need for large stores of goods and less need for so many traders who are primarily organized within the traditional modes of social organization.

Some final remarks are made concerning the stability of the present society and it is concluded that it is the behaviour norms that form the major basis of stability. These in turn are dependent upon the socialization techniques, the present political and economic organization and the "cross-linkage" of social relationships vertically and horizontally throughout the society.

Microfilm \$4.90; Xerox \$17.35. 381 pages.

FAMILY ORGANIZATION IN BARBADOS

(L. C. Card No. Mic 60-1140)

Sidney Martin Greenfield, Ph.D.
Columbia University, 1959

The Negro family in the New World, and in the West Indies in particular, has been the subject of many studies of social scientists during the past three decades. It has been demonstrated that consanguineal ties, and most particularly the mother-child bond, are usually stronger and more durable than the conjugal relationship. Most studies emphasize the importance of the position of the mother in the family system.

Wherever it occurs in the New World, this mother-centered or matrifocal family appears to be part of a culture complex exhibiting certain characteristic features. These include a high rate of illegitimacy, a correspondingly low percentage of "legal" marriages, large numbers of children per household, easy adoption practices, marginal roles for husband-fathers, a high percentage of female heads of households and general familial insta-

bility. It was assumed, apparently, that this complex was a distinctively New World Negro phenomenon, and attempts were made to explain its occurrence. Three theories are to be found in the literature; two culture-historical and one structural-functional.

In this dissertation both structural-functional and culture-historical analysis are combined in the examination of the data collected by the writer--by the use of the community study method--in the Negro village of Enterprise Hall on the Island of Barbados. The fieldwork was carried out during the period June 1956 to September 1957 with the aid of research grants from the Social Science Research Council and the Study of Man in the Tropics.

The family--defined as a social institution whose primary task is to provide for the protection and upbringing of children--takes two major forms in Enterprise Hall; one matrifocal and the other nuclear. By examining the family in its household setting and then placing it in the island's system of social stratification, matrifocality is shown to be a variant of the focal nuclear family that correlates with lower-class status. Lower-class men are unable to obtain positions in the economic system that provide sufficient income and prestige for them to become the focus of a nuclear family. Since the male role calls for economic support and status placement, lower-class men are unable to fulfill their role obligations and consequently become marginal in the daily operations of the family. This situation produces the matrifocal family in which the mother-child bond replaces the conjugal relationship as the focus of the family system.

With the attainment of middle-class status, however, where men are able to fulfill their role obligations, the villagers adopt the focal nuclear family, the form of which is structurally similar to that of the nuclear family found in industrialized countries such as Great Britain and the United States.

A comparison of the Barbadian and American nuclear family reveals that both the forms and their functioning within the larger socio-cultural context are similar and that matrifocality is a variant that appears among the lower classes in both places.

Microfilm \$2.95; Xerox \$10.15. 225 pages.

ASTRONOMY

THE IONIZATION CROSS-SECTION OF FeXIV IN THE SOLAR CORONA BY ELECTRON COLLISION AND ITS RELATIONSHIP TO THE TEMPERATURE OF THE CORONA

(L. C. Card No. Mic 60-1045)

Sanford Bernard Schwartz, Ph.D.
University of Colorado, 1959

Supervisor: Professor Walter Orr Roberts

The general problem of determining an estimate of the temperature of a quiet region of the solar corona is discussed.

The essential problem of investigating the basis of disagreements between temperatures determined by the ionization equilibrium theory and thermal Doppler line broadening methods is attacked. A new calculation of the ionization cross-section of FeXIV by electron collision is given, using a Hydrogen-like model, where all continuum wave-functions approach Coulomb functions at large distances from the atom. The resulting cross-section is about a factor of 10 smaller than the values in current use, and has the effect of giving an electron kinetic temperature of about 2×10^6 deg., which is in good agreement with the ion kinetic temperature obtained from the Doppler line broadening.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

BACTERIOLOGY

AN INVESTIGATION OF CROSS-RESISTANCE IN *ESCHERICHIA COLI*

(L. C. Card No. Mic 60-814)

William Murray Bain, Ph.D.
Indiana University, 1959

Chairman: Dr. W. A. Konetzka

The nature of bacterial cross-resistance to antibiotics and surface active agents was investigated. Bacteria which had acquired resistance to chloramphenicol and cetyltrimethylammonium bromide (CTAB) were obtained by serial passage through increasing concentrations of the particular agent. Both strains were cross-resistant to laurylpyridinium chloride, penicillin, and chlortetracycline. In addition, the chloramphenicol resistant strain was resistant to polymyxin; the CTAB resistant strain was also resistant to streptomycin. A reciprocal cross-resistance existed between the two strains; the chloramphenicol resistant strain was resistant to CTAB and the CTAB resistant strain was resistant to chloramphenicol.

Quantitative measurements of the effect of ionic detergents on the viability of the chloramphenicol sensitive and resistant strains confirmed the results of the cross-resistance studies. CTAB caused a rapid loss of viability in the sensitive strain. A rapid, initial loss of viability characterized the resistant strain; however, within a few minutes, a stable resistant population was established. Sodium lauryl sulfate (SLS) caused an initial, slight loss of viability in both strains, but the remaining cells were completely resistant to SLS.

No differences could be detected in the effect of CTAB or SLS on isolated cell walls of sensitive and resistant organisms. Cell walls of both types were rapidly dissolved by SLS, but there was no apparent effect of CTAB. No significant difference could be detected in the lipid content of the cell walls of the two types.

The resistant strains were examined for the presence of enzymes capable of converting chloramphenicol to a biologically inactive form. Whole cells of the chloramphenicol and CTAB resistant organisms contained twice as much nitro reductase as the sensitive strain; however, this amount of enzyme was not sufficient to account for the degree of resistance.

Examination of the nitro reductase activity of cell-free preparations of the chloramphenicol sensitive and resistant strains indicated that the resistant organism is less permeable to chloramphenicol. The chloramphenicol resistant cells were also found to adsorb less chloramphenicol than the sensitive strain.

Induced enzyme synthesis was not inhibited by chloramphenicol in the chloramphenicol resistant organism. Chloramphenicol in sub-bacteriostatic levels inhibited induced synthesis in the sensitive strain. This inhibition could be overcome, provided that low concentrations of chloramphenicol were used. The time necessary for

reversal correlated with the time required for the reduction of the chloramphenicol by the nitro reductase present.

The CTAB resistant organism was found to have acquired a constitutive beta-galactosidase during the selection procedure for resistance to CTAB. The possibility that the CTAB resistant strain still required a lactose permease was not eliminated, but if such a system is present, it is not induced.

The results of the cross-resistance, nitro reductase, and chloramphenicol adsorption studies support the hypothesis that a general resistance to deleterious agents can be acquired through the alteration of the permeability barriers of the cell.

Microfilm \$2.50; Xerox \$5.20. 102 pages.

STUDIES OF THE ANTIGENIC NATURE OF THE MYXOVIRUSES.

I. ANTIGENIC RELATIONSHIPS AMONG MYXOVIRUSES.

II. ANTIGENIC VARIATIONS OF NEWCASTLE DISEASE VIRUS.

(L. C. Card No. Mic 60-987)

Philip Hoxie Coleman, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor R. P. Hanson

In the first series of investigations the antigenic relationships among six myxoviruses were studied by means of the hemagglutination-inhibition, serum neutralization, and gel precipitation tests. The strains of virus employed were the PR8 strain of influenza A, Lee strain of influenza B, Henle-Enders strain of mumps, Sendai strain of parainfluenza 1, N virus strain of fowl plague, and 12 strains of Newcastle disease virus. Hyperimmune serum for each strain was prepared in rabbits and convalescent serum was prepared in guinea pigs, ferrets, and chickens. Chicken convalescent serum for a classical strain of fowl plague virus was also included.

Influenza B was antigenically unrelated to any of the other strains. Influenza A and N virus were unrelated to the other myxoviruses but were related to each other and to the classical strain of fowl plague. This relationship could be demonstrated only in the gel precipitation test. Sendai virus showed a definite relationship with both mumps and Newcastle disease viruses. These relationships could be demonstrated by all three serological methods. There was also suggestive evidence of an antigenic relationship between mumps and Newcastle disease virus in that guinea pig anti-mumps serum contained a low level of antihemagglutinins for two strains of Newcastle disease virus.

The degree of relationship between N virus, influenza A,

and classical fowl plague was determined in the gel precipitation tests. Influenza A was found to have one antigenic fraction in common with both classical fowl plague and N viruses. N virus had two antigenic fractions in common with the classical strain of fowl plague.

In the second series of investigations comparative antigenic studies were done on 12 strains of Newcastle disease virus by means of the hemagglutination-inhibition, serum neutralization, and gel precipitation tests. Hyper-immune serum for each strain was prepared in rabbits and convalescent serum was prepared in chickens.

Definite quantitative variations could be detected among strains of Newcastle disease virus in the hemagglutination-inhibition and serum neutralization tests, although definite qualitative differences could not be detected. In the gel precipitation tests from one-to-three lines of precipitate formed between antigen and antibody reservoirs. The number of precipitates formed differed depending on the strain of virus and the strain of antiserum employed. From the results obtained it was concluded that antigenic types of viruses could not be postulated on the basis of the number of lines of precipitate formed. However two strains, Milano and NY, were found to be only partially identical to each other and to other strains in comparative gel precipitation studies.

Microfilm \$2.50; Xerox \$5.40. 107 pages.

CHARACTERISTICS OF SOME SMALL-COLONY-FORMING VARIANTS OF *STAPHYLOCOCCUS AUREUS*.

(L. C. Card No. Mic 60-1065)

William Eugene Dye, Ph.D.
University of Colorado, 1959

Supervisors: Associate Professor Gardner Middlebrook
Assistant Professor Robert Samuels

When normal staphylococci were aged in broth cultures or subcultured in trypticase soy broth containing graded concentrations of antimicrobial agents, small-colony-forming variants appeared among the isolates. In addition, cultures of two similar small-colony-forming staphylococci were isolated from human clinical infections. Growth of five of these strains was studied in detail.

Colony diameter was the primary characteristic upon which growth response of the strains was measured. The colony diameter of normal and small-colony-forming staphylococcal variants was shown to be a function of the number of colonies per plate; the nature, strength, and volume of the test medium; and the presence or absence of inhibitory substances in the medium.

Normal staphylococci grown on nutritionally-deficient media grew as small colonies which resembled the selected variants in their failure to produce hemolysins, pigment, coagulase, catalase, or to produce acid from carbohydrates.

After growth on trypticase soy agar for three days in air at 36° C, colonies of the small-colony-forming staphylococcal strains were 0.02 to 1 mm in diameter, translucent or opaque, nonpigmented, and showed decreased or absent catalase, coagulase, and hemolytic activity and

ability to produce acid from carbohydrates. The small-colony-forming variants showed a marked increase in susceptibility to inhibition by sulfathiazole, but otherwise possessed the same general drug-susceptibility pattern as the normal staphylococci from which they were derived. Four of the variants studied were shown to be auxotrophic organisms with previously undescribed requirements for certain long-chain, unsaturated fatty acids. The fifth strain required pyridoxal-group vitamins or certain metabolites of pyridoxal-containing enzymes. On trypticase soy agar supplemented with the required growth factors, the small-colony-forming variants grew with most, but not all, of the properties of normal staphylococci. Microfilm \$2.50; Xerox \$5.20. 101 pages.

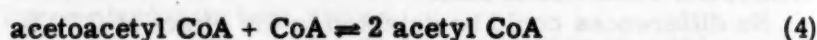
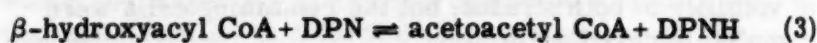
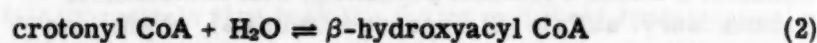
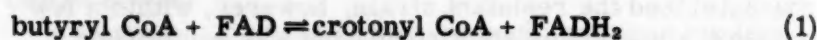
FATTY ACID OXIDATION BY SOLUBLE ENZYMES OF *MYCOBACTERIUM TUBERCULOSIS*

(L. C. Card No. Mic 60-992)

Alan Gelbard, Ph.D.
The University of Wisconsin, 1960

Supervisors: Professor J. B. Wilson and
Associate Professor Dexter Goldman

Cell-free extracts of the H₃₇Ra strain of *Mycobacterium tuberculosis* have been prepared by sonic oscillation. These extracts contain the enzymes involved in the β -oxidation of fatty acids. These enzymes include butyryl dehydrogenase (reaction 1), enoyl hydratase (reaction 2), β -hydroxyacyl dehydrogenase (reaction 3) and β -keto acyl thiolase (reaction 4)



These enzymes have been partially purified and shown to catalyze the same reactions as catalyzed by the analogous enzymes of animal tissues.

The dehydrogenation of butyryl CoA has been resolved into a two step reaction involving two flavoproteins. The first flavoprotein, the butyryl dehydrogenase, oxidizes the substrate. The second enzyme, the electron transferring flavoprotein (ETF), catalyzes the oxidation of the reduced butyryl dehydrogenase by indophenol and other electron acceptors. Several physical differences have been noted between these two enzymes as found in H₃₇Ra as compared to the analogous enzymes in animal tissues. The mycobacterial butyryl dehydrogenase differs from the mammalian enzyme in such properties as color, absorption spectrum and the ability to be dissociated from its flavin moiety. The ETF differs from the animal ETF by its extremely low flavin content. Evidence for the possibility of separate ETFs, specific for different chain lengths has been presented. A preliminary investigation to determine how binding of the substrate is related to the presence of bound flavin in the enzyme was undertaken.

This study establishes that the oxidation of fatty acids by an aerobic bacterium follows the classical β -oxidation

reaction sequence previously established for animal tissues. Microfilm \$2.50; Xerox \$6.00. 121 pages.

STUDIES ON IMMUNITY TO JAPANESE ENCEPHALITIS VIRUS

(L. C. Card No. Mic 60-934)

Ho Wang Lee, Ph.D.
University of Minnesota, 1959

Adviser: William F. Scherer, M.D.

Japanese encephalitis (JE) is a widespread human disease throughout the Far East. Human infection occurs through bite of infected *Culex* mosquitoes, is commonly asymptomatic, and is manifested only by formation of specific antibodies. In endemic areas, humans are exposed each summer or continuously to infected mosquitoes, and although human anamnestic antibody responses apparently occur with JE virus, they have not yet been unequivocally established. Moreover, if anamnestic antibody responses to arthropod-borne viruses occur naturally in humans, their mechanism requires explanation because serum of previously infected humans contains neutralizing antibody which presumably inactivates virus shortly after inoculation.

Studies were designed a) to learn whether small quantities of JE virus such as might be inoculated intradermally by mosquitoes in nature will engender anamnestic antibody responses and b) to explore the mechanism of anamnestic antibody formation following intradermal inoculation of virus. Three specific questions regarding mechanism of anamnestic antibody formation were asked. 1) Does intradermally inoculated virus multiply in the skin or nearby tissues of a previously infected host? 2) What quantity of mosquito-derived virus stimulates an anamnestic antibody response? 3) Will non-infectious virus stimulate a secondary antibody response?

Cynomolgus monkeys were infected by intradermal inoculation of JE virus in suspensions of naturally infected Japanese mosquitoes, *Culex tritaeniorhynchus*. Virus in blood and tissues were measured by intracranial inoculation of Swiss-albino mice. Neutralizing (N) and hemagglutination-inhibition (HI) antibodies were measured at selected intervals after intradermal inoculation of virus.

Before studying the anamnestic antibody response to JE virus, it was necessary a) to become familiar with viremia and antibody responses in susceptible monkeys, b) to learn whether virus multiplies in skin and nearby tissues of susceptible monkeys and c) to determine the minimal infective intradermal dose of virus in mosquito suspensions. Subsequently, attempts were made to find viremia and dermal multiplication of virus in previously infected monkeys and to relate the quantity of infectious virus that engenders an anamnestic antibody response to that producing primary infection. Also, the ability of non-infectious virus to produce an anamnestic antibody response was determined.

Viremia occurred and lasted from 1 to 7 days after intradermal inoculation of susceptible monkeys with suspensions of naturally infected Japanese mosquitoes. Skin and superficial tissues were not sites of virus multi-

plication. HI antibody appeared in serum of all viremic monkeys by 14-22 days after intradermal inoculation of virus. No monkeys produced HI antibody without having demonstrable viremia. The intradermal infectious dose for 50% of susceptible monkeys was 25-50 suckling mouse intracranial lethal dose₅₀.

In previously infected monkeys neither viremia nor virus multiplication in skin and superficial tissues were demonstrated after inoculation of virus. An anamnestic HI antibody response occurred in previously infected monkeys. Using JE virus in suspensions of naturally infected Japanese mosquitoes, the intradermal anamnestic antigenic dose for 50% of monkeys was 200 SM ic LD₅₀. High pre-existing antibody levels did not prevent anamnestic antibody responses after intradermal inoculation of virus. Ultraviolet-irradiated, non-infectious virus stimulated an anamnestic HI antibody response.

Appendices A and C describe attempts to grow JE virus in porcine kidney and calf kidney primary cell cultures *in vitro*. Porcine kidney cells support growth of virus and are concomitantly destroyed. Calf kidney cells also support growth of virus but cells were not destroyed and virus titers were not as high as in porcine kidney cell cultures. Appendix B describes attempts to inactivate JE virus released from porcine kidney cells for use as a vaccine in studying the anamnestic antibody response to JE virus. Two difficulties were encountered that made vaccine preparation difficult. First, virus stored without protein was unstable on dry ice. Secondly, sufficiently potent virus could not be produced consistently in these cultures. Microfilm \$2.50; Xerox \$4.80. 92 pages.

HOST-PARASITE RELATIONSHIPS BETWEEN PASTEURILLA TULARENSIS AND MONONUCLEAR PHAGOCYTES FROM NORMAL AND IMMUNE RATS

(L. C. Card No. Mic 60-901)

Helen McElree, Ph.D.
University of Kansas, 1959

Cultured mononuclear cells, obtained from the peritoneal cavity of normal and immune white rats, were used as an *in vitro* system for the study of various aspects of the host-parasite relationships in tularemia. The mononuclear cells were successfully maintained for relatively long periods of time in Scherer's tissue culture medium supplemented with heated calf serum.

The phagocytosis of *Pasteurella tularensis* was found to be influenced by the type of serum used to supplement the medium, the presence of inflammatory products, and the immune state of the cell donors. The enhanced phagocytosis exhibited by cells obtained from animals pretreated with an inflammatory irritant, or by cells obtained from immunized animals, was due to factors present in the supernate fraction of the exudates.

The intracellular multiplication of *P. tularensis* was influenced by the type of irritant used to elicit the exudate, the immune state of the cell donors, and the virulence of the organism. Exudates from peptone treated animals exerted a limited bacteriostatic or bactericidal effect for intracellular *P. tularensis* as compared to exudates

obtained from glycogen treated or untreated animals. Mononuclear cells from immunized rats were able to suppress the intracellular multiplication of *P. tularensis* in contrast to normal mononuclear cells which allowed unrestricted multiplication.

The fully virulent strain SM-S₄ multiplied rapidly in normal rat mononuclear cells in contrast to the avirulent strain 38. Strain 38 was unable either to multiply intracellularly or to exert cytopathic effects. The attenuated strain Jap was intermediate in its ability to grow intracellularly or induce injury in the host cells.

Immune rats responded to the injection of a killed tularemia vaccine with a more rapid and elevated cellular response as compared to the normal control rats.

Attempts to control extracellular multiplication of organisms by incorporating low levels of streptomycin in the tissue culture medium resulted in a decline in viable intracellular tularensis bacilli. In some instances a toxic effect on the mononuclear cells was noted which was attributed to bacterial products released by the lytic action of the streptomycin.

Preliminary studies indicated that susceptibility of cultured mononuclear cells to *P. tularensis* was related to the species from which the cells were obtained. The significance of this was discussed.

Microfilm \$2.50; Xerox \$7.20. 155 pages.

AN IN VITRO STUDY OF EXTRACTED ANTIGENS OF *VIBRIO FETUS* ISOLATES

(L. C. Card No. Mic 59-5254)

Gordon Wesley Robertstad, Ph.D.
Colorado State University, 1959

An understanding of the antigenic make-up of *Vibrio fetus* is basic to the production of an effective protective immunizing agent against vibriosis and to the development of a useful diagnostic reagent.

This investigation is a study of extracted antigens of bovine, human and ovine isolates of *V. fetus* against whole cell rabbit antisera by the Oakley-Fulthorpe and Ouchterlony agar diffusion techniques.

A shaker method of growing *V. fetus* in broth produced a high cell yield (15.5-22.0 per cent light transmittance) in 24 hours. The utilization of this method made it possible to grow a sufficient quantity of cells for antigenic fractionation.

Saline and two per cent phenol were effectively used to extract antigens from eight different *V. fetus* isolates. These isolates were divided into three major groups when the saline and phenol extracts were tested by the Oakley-Fulthorpe agar diffusion technique against whole cell rabbit antisera. Two additional isolates of *V. fetus* fell into one of these three groups on the basis of their antisera reaction with the saline and phenol extracts of these eight isolates.

It was further shown by the Ouchterlony agar diffusion technique that: 1) the saline and phenol fractions of the isolates in groups I and II contained a single antigen, 2) the antigen of group I was not related to the antigen of group II, 3) the isolates in group III possessed multiple antigens which cross-reacted with isolates in groups I

and II, and 4) the major antigen of group III was in the phenol fraction.

This study demonstrated the antigenic heterogeneity of *V. fetus* and the feasibility of using saline and phenol extracts to identify unknown isolates. With the few isolates of *V. fetus* studied from bovine, ovine and human origin, no antigenic pattern was found associated with source of isolation.

Microfilm \$2.50; Xerox \$4.40. 82 pages.

HYDROGEN OXIDATION AND ELECTRON TRANSPORT IN SPECIES OF *HYDROGENOMONAS*

(L. C. Card No. Mic 60-845)

Charles Louis Wittenberger, Ph.D.
Indiana University, 1959

Hydrogen oxidation and electron transport were investigated in two members of the genus *Hydrogenomonas*. *Hydrogenomonas* sp., an organism isolated from local soil, and *Hydrogenomonas eutropha* possess certain characteristics in common. When grown autotrophically, both organisms are insensitive to high partial pressures of oxygen. Good growth is obtained in an atmosphere consisting of 70 per cent hydrogen, 10 per cent carbon dioxide and 20 per cent oxygen. In addition, both organisms couple hydrogen oxidation to the reduction of the artificial acceptor, methylene blue. Furthermore, cell-free extracts from both organisms contain flavin and a "c" type cytochrome. These endogenous components are reduced in an atmosphere of hydrogen and are reoxidized under highly aerobic conditions. The oxidation of cytochrome "c" suggests that cytochrome oxidase is also present in these extracts, however, no spectrophotometric evidence for this enzyme was obtained.

Hydrogenomonas sp. and *H. eutropha* differ from one another in several other characteristics. Hydrogenase is largely associated with sub-cellular particles in cell-free extracts of *Hydrogenomonas* sp., while the enzyme is soluble in cell-free extracts of *H. eutropha*. Moreover, extracts of *H. eutropha* actively catalyze the reduction of diphosphopyridine nucleotide (DPN) by hydrogen, though not of triphosphopyridine nucleotide (TPN), while both resting cells and cell-free extracts of *Hydrogenomonas* sp. are completely inactive with either DPN or TPN.

The soluble DPN reducing system in extracts of *H. eutropha* is quite stable to high partial pressures of oxygen. Essentially no loss of activity results from storing the extracts under 100 per cent oxygen at 5 C for 2 1/2 hours.

The reduction of DPN by cell-free extracts of *H. eutropha* requires the mediation of one or more unidentified components in addition to hydrogenase. When the soluble DPN reducing system was fractionated by using standard ammonium sulfate techniques, two fractions were obtained, both of which were required for the maximum rate of DPN reduction. Reduction of the pyridine nucleotide by hydrogen is inhibited by cyanide and Versene at concentrations that have little or no effect on the reduction of methylene blue and it is, therefore, likely that a metal or metallo-enzyme is required for DPN reduction in addition to hydrogenase.

Attempts to show reversibility of the DPN reducing system by demonstrating hydrogen evolution from added DPNH were unsuccessful. However, the techniques employed were not sensitive enough to detect hydrogen evolution from DPNH if the equilibrium of the reaction were greater than 95 per cent in favor of DPNH formation, and it is still possible that the reaction is reversible.

Extracts of *H. eutropha* oxidize the reduced pyridine nucleotide aerobically via a cyanide sensitive pathway.

Anaerobically, these preparations also oxidize DPNH by coupling it to the reduction of endogenous flavin and cytochrome "c". Since endogenous flavin and cytochrome "c" can be reduced both by hydrogen in the absence of added DPN, and by DPNH, it is possible that the pyridine nucleotide is not a required intermediate in the sequence of reactions between hydrogen and oxygen.

Microfilm \$2.50; Xerox \$7.40. 160 pages.

BIOGRAPHY

NEVADA'S KEY PITTMAN

(L. C. Card No. Mic 60-1145)

Fred L. Israel, Ph.D.
Columbia University, 1959

Key Pittman was born in Vicksburg, Mississippi on September 19, 1872, son of William Buckner and Catherine (Key) Pittman. Pittman was educated by private tutors and at Southwestern Presbyterian University, Clarksville, Tennessee. Shortly after leaving college, he went to Seattle, Washington, where he studied law in the office of James Hamilton Lewis, later United States Senator from Illinois, under whose guidance he began practice upon his admission to the bar in 1892.

Following the discovery of gold in the Klondike, Pittman went to Alaska in 1897 and spent two years working as a miner. In 1899 he opened a law office in Nome, where he became active in a movement to curb lawlessness by a "consent" form of local government. He became the first prosecuting attorney under that government. In January 1902, Pittman moved to Tonopah, Nevada, where new silver mines had just been discovered. Here he achieved distinction and success as a specialist in mining law. In 1910 Pittman was defeated as the Democratic candidate for United States Senator from Nevada. He was again nominated in 1912 and was elected by the legislature on January 29, 1913. Shortly thereafter he took his seat in the Senate in which, by successive re-elections, he served until his death.

Pittman was one of the ablest silver champions in the Senate. In 1918, as a member of the Committee on Mines and Mining, he introduced and secured passage of the measure known as the Pittman Silver Act, which provided for the purchase and coinage of 200,000,000 silver dollars. The Senator attended the World Economic Conference held in London in 1933 and was credited with bringing about the only definite accomplishment of the conference -- the negotiation of an international silver stabilization agreement. Throughout his years in the Senate, Pittman supported silver purchase plans. He was a master in manipulation of amendments, riders, and conference committee compromises. He succeeded in welding the representatives of the Rocky Mountain states into a firm silver bloc in order to obtain concessions for the white metal.

In 1916, Pittman was appointed to the Foreign Relations Committee in an attempt to increase his prestige back home. For seventeen years he attended meetings, rarely speaking, unless international monetary agreements were discussed. The defeat, death, and retirement of Democratic committee members caused Pittman's leather chair to be shifted closer to the head of the long green baize covered table. With the Democratic landslide in 1933, Pittman was elected chairman. The dissertation contains a detailed account of the workings of the Foreign Relations Committee 1933-1940 and Pittman's role in formulating the administration's neutrality legislation. The Senator died in Reno on November 10, 1940.

Microfilm \$4.55; Xerox \$16.00. 355 pages.

BIOLOGY — GENETICS

SELF- AND CROSS-FERTILITY IN BIRDSFOOT
TREFOIL, LOTUS CORNICULATUS L.

(L. C. Card No. Mic 60-1276)

Nevin George Brandenburg, Ph.D.
University of Maryland, 1959

Supervisor: Associate Professor Robert C. Leffel

Investigations concerning inheritance of self-fertility and self-incompatibility, inbreeding effects, environmental variability of seed set, and pollination methods in birdsfoot trefoil, Lotus corniculatus L., were conducted in the greenhouse at the Plant Industry Station, Beltsville, Maryland during the winters of 1956-57, 1957-58, and 1958-59. Five clones varying in degree of self-fertility and other clones of agronomic value were utilized.

Seven F_1 crosses among five clones varying in degree of self-fertility exhibited partial or no dominance of self-sterility. Deviations of F_1 means from biparental means ranged from -0.2 to 19.3 percent pod set. Fourteen F_1 plants from a cross between two self-incompatible parents were evaluated for self-incompatibility, intercrossed in all possible combinations, and backcrossed to both parents reciprocally to investigate the genetical basis of self-incompatibility. All F_1 plants were self-incompatible. Neither F_1 intercrosses nor reciprocal backcrosses exhibited cross-incompatibilities. F_1 plants from four crosses exhibited a small but significant decrease in seed set for sibmating as compared to outcrossing, demonstrating average decreases for sibmatings of 5.1, 5.2, and 9.4 percent for seeds per pod, percent pod set, and seeds per flower pollinated, respectively.

Inbreeding resulted in a much greater decrease in self-fertility than in plant vigor, and few abnormalities were observed as a consequence of selfing. Rate of pod development was determined following selfing and outcrossing of S_1 plants. Practically all abortion of developing pods occurred prior to the seventh day after pollination. By the fifth day subsequent to pollination all pods resulting from cross-fertilization had made noticeable longitudinal development; a few self pods, however, were not yet evident. Subsequent to pollination pod length increased rapidly until the ninth day, and maximum length of pod was essentially attained in eleven days.

Pollinations performed in the spring were more successful than those made during midwinter. Pollinating at different times during the day from April 1 to mid-May did not show any relationship between time of pollination and seed set. A toothpick technique was more efficient in the production of self seed than was manual manipulation of individual florets or umbels.

Microfilm \$2.50; Xerox \$5.20. 103 pages.

THE GENETICS OF HYBRID STERILITY
IN DROSOPHILA PAULISTORUM

(L. C. Card No. Mic 60-1134)

Lee Ehrman, Ph.D.
Columbia University, 1959

Male hybrids between subspecies, or incipient species, of the Drosophila paulistorum complex (Centro-American, Amazonian, and Andean-South Brazilian) are completely sterile. Hybrid females are fertile and can be backcrossed to either subspecies. Experiments have been made with chromosomes of the different subspecies marked by suitable marker genes which permitted the distribution of a given chromosome to be followed through a series of repeated backcrosses. The evidence is consistent with the view that any female which carries any mixture of the chromosomes of different subspecies deposits eggs giving rise to sterile male zygotes and to fertile female ones. The sterility of a male depends, in the backcrosses, on the genetic constitution of his mother, and not on his own genetic constitution. In other words, the properties of an egg are determined, as far as the sterility of the backcross males is concerned, by the genotype present in it before meiosis, and not by that formed following fertilization. It should be noted that the presence in the mother of just one subspecies-foreign chromosome is already sufficient to make it produce sterile sons. The situation in D. paulistorum is compared with that in the "grandchildless" mutant in D. subobscura, and with that in the hybrids between certain subspecies of Culex mosquitoes. It is in several respects different from either, and seems to be unprecedented in the genetic literature. Microfilm \$2.50; Xerox \$3.00. 31 pages.

STUDIES ON THE NUTRIENT REQUIREMENTS
FOR COLONY FORMATION OF
SINGLE MAMMALIAN CELLS

(L. C. Card No. Mic 60-1035)

Harold Wilbur Fisher, Ph.D.
University of Colorado, 1959

Supervisor: Professor Theodore T. Puck

The nutritional requirements of the isolated mammalian cell cultured *in vitro*, were examined by experiments where the cells were manipulated as independent microorganisms, using the techniques developed by Puck and his co-workers. These techniques, which include such standard microbiological methods as plating efficiency, single-cell growth curves, cloning and titration were the principal assay procedures used in this study.

Stable inherited nutritional differences in isolation

were shown between two clonal populations, S1 and S3, which had been isolated from the parental HeLa culture and were morphologically identical in culture. Isolated cells of clonal populations of fibroblast-like cultures were found to have more demanding nutritional requirements than those of epithelioid-like appearance. Irradiated non-multiplying 'feeder' populations were found to consistently allow the plating efficiency of cultures to approach 100 per cent. In model test systems, the 'feeder' population was shown to be able to supply a nutritional requirement for inositol to a medium which was inadequate for isolated colony formation of HeLa S3 cells because of its omission. Furthermore, the 'feeder' population was shown to be able to overcome a toxic level of antiserum to HeLa S3, in the presence of which a maximal difference in plating efficiency could be demonstrated with and without the 'feeder' system.

Macromolecular-micromolecular interrelationships were examined in media for isolated colony formation of HeLa S3, composed of dialyzed serum and synthetic molecules. Since some of the synthetic micromolecular supplements to the serum dialysate were subsequently not required in a medium where the macromolecular portion was better defined, it was theorized that their requirement might be to overcome toxicities developed in extensively dialyzed serum.

In conducting experiments with serum dialysate necessary for colony growth, the interesting phenomenon of attachment and stretching of the cells on glass surfaces was shown to require a serum macromolecular supplement in the medium. This requirement is satisfied by purified fetuin, a component of fetal calf serum which has been described in the literature. The data also indicate that a divalent ion requirement for the attachment and stretching of the cells on glass is best satisfied by 1×10^{-3} M Mg.

Physical and chemical properties of fetuin preparations used in these studies were determined and found to be consistent with descriptions in the literature which describe it as an alpha-globulin glycoprotein of fetal calf serum.

A medium composed of purified albumin and fetuin and synthetic micromolecules was delineated. This medium gives quantitative colony formation from single HeLa S3 cells at close to 100 per cent plating efficiency, and from growth curves, the generation time was determined and shown to be only about 50 per cent greater in this defined medium than in one containing 30 per cent serum. With this defined medium, a critical nutritional requirement for either cystine or cysteine was found for isolated colony formation of HeLa S3, but the oxidation-reduction potential of the cystine-cysteine system was found relatively unimportant.

Problems of purity inherent in protein chemistry are discussed in relation to the requirements in this medium, and significant applications of the medium in studies of the mammalian cell in culture are suggested.

Microfilm \$2.50; Xerox \$6.60. 140 pages.

RELATIONS BETWEEN BACKFAT THICKNESS AND OTHER ECONOMIC TRAITS IN SWINE

(L. C. Card No. Mic 60-921)

Richard Romaine Fox, Ph.D.
University of Minnesota, 1959

Adviser: R. E. Comstock

Data were obtained on about 1350 pigs from the University of Minnesota Swine Breeding Projects (North Central and Central Stations) and the Minnesota Swine Evaluation Stations located at New Ulm and Austin, Minnesota. Carcass measurements were available for 239 pigs.

Phenotypic estimates of regression and correlation were computed for backfat thickness (live probe) with feed per unit gain and rate of gain. Estimates were also determined among all pairs of carcass traits; i.e. carcass backfat, carcass length, loin eye area, and the percentage of four lean cuts.

All analyses were done using individual pigs on an intra station and within seasons, feeding levels and sex basis with the exception of the correlation of backfat with feed per unit gain and the coefficient of regression of feed per unit gain on backfat thickness. Here litter on pen means were employed. The relative proportions of each sex in the individual pens or litters were either held constant or were found to have no significant effect on the results.

Phenotypic estimates of correlation found in this study are as follows; .22 for backfat with feed per unit gain, -.48 for backfat with carcass length, -.18 for backfat with loin eye area, -.44 for backfat with the percent of four lean cuts, .27 for carcass length with the percent of four lean cuts, -.61 for loin eye area with the percent of lean cuts and no correlation was found between either backfat and rate of gain or carcass length and loin eye area. It is apparent from these that within a particular year or breeding group, selection for lowered backfat would be selection for lowered feed costs, slightly higher percentage of four lean cuts and possibly a longer carcass with an increased area in the loin eye muscle. The magnitude of the selection differentials would be, based on the regression coefficient estimates determined in this study, approximately three to four pounds less feed required per hundred pounds of gain, 0.4 percent increase in the percentage of four lean cuts, 0.2 inches longer carcass and 0.05 square inches more area in the loin eye area for each 0.1 of one inch less backfat thickness. The extent to which these selected traits would be transmitted to the next generation would depend, however, on the degree to which each specific trait was heritable and the genetic correlations among them.

A primary fact to be noted is that selection based on backfat measured on the live animal itself is likely to be as effective for genetic improvement in lean content of carcass as selection based on measurement of lean content on sibs of potential breeding animals. A critical factor in this connection is the size of the genetic correlation between the live measure of backfat and lean content of carcass, about which further information is needed.

From evidence reported to date it is clear that the correlation of backfat thickness with the percentage of four lean cuts is at least as large as that of loin eye area

with the percentage of four lean cuts. This means that, for genetic improvement of the lean content in the carcass, backfat thickness on the live animal would probably be as effective a selection criterion as loin eye area would be.

Based on the results of this study it is reasonable to infer that backfat thickness has very little association with the rate of gain of the individual provided that the backfat measurement is either taken at or adjusted to a constant weight for comparative purposes and that the ration fed is adequate for unrestricted growth.

Microfilm \$2.50; Xerox \$3.00. 57 pages.

GENETICS OF BODY SIZE IN A RANDOMBRED POPULATION OF THE DOMESTIC FOWL

(L. C. Card No. Mic 60-1216)

James Harvey Smith, Ph.D.
The Ohio State University, 1959

A knowledge of the genotypic variance of body size and its basic components, cell size and cell number, is of fundamental importance in the theory and practice of poultry breeding.

In Part I, estimates of the genotypic (additive plus non-additive) variance and of the environmental variance of body weight at 8, 16, and 24 weeks of age were calculated from the female progeny of diallel matings in a randombred population of White Gold chickens. The relative importance of maternal and sex-linked gene effects on body size was measured at each age. These parameters were estimated from two groups of diallel matings, based on the estimation of covariance between relatives. The first group included two daughters per sire x dam mating and the second, four daughters per mating. There were 672, 640, and 616 individual matings with two daughters per mating, and 292, 220, and 148 matings with four daughters per mating.

Heritability was also calculated from a full sib analysis at each of the three ages. An additional estimate of additive gene effects at eight weeks was made from a growth selection experiment.

The results were summarized as follows:

1. The mean estimates of additive genetic effects were 0.38, 0.45, and 0.36 for 8, 16, and 24-week body weight.
2. Non-additive genetic effects were 0.26, 0.21, and 0.20 for 8, 16, and 24-week body weights.
3. Maternal effects were present at eight weeks of age, with a mean effect of 0.14. However, maternal effects at older ages were either non-existent or were indeterminable because of sex-linked gene effects.
4. Sex-linked gene effects on body weight of females were important at 16 and 24 weeks of age.

Part II was concerned with the relative importance of size and number of cells to total muscle (body) size and with the genetic effects on size and number of cells in specific skeletal muscles. Four populations were studied: Randombred and Growth Selected White Golds, White Leghorns, and Bantams. The importance of additive and of non-additive genetic effects on muscle cell size and cell number was estimated from breed and strain crosses. Muscle cell number was estimated at hatching, and cell size was determined at ten weeks of age by cross-diameter measurement of teased fibers.

Conclusions from Part II of the dissertation follow:

1. Hyperplasia in skeletal muscle tissue occurs primarily before hatching and hypertrophy during the post-hatching period.
2. Muscle cell (fiber) number was similar in the two sexes. Males have larger muscle cells than females, which accounts for the larger muscle size in the male.
3. At hatching, Randombred White Golds had more and slightly smaller muscle cells than White Leghorns of similar body weight. At ten weeks of age the large-bodied Randombred White Gold had considerably larger muscle fibers than the small-bodied White Leghorn. The reciprocal crossbreds were approximately equal to the parental means for both cell size and number at hatching, and for cell size at ten weeks of age.
4. The Growth Selected White Golds possessed slightly smaller and, therefore, a greater number of cells at hatching than did the Randombred White Golds. At ten weeks of age Growth Selected White Golds had significantly larger muscle cells than the Randombred population. Muscle weight and cell size were intermediate in reciprocal crosses between the Randombred and Growth Selected White Golds.
5. Although large-bodied chickens had both larger cells and a greater number of muscle cells at broiler age than did small-bodied chickens, cell size was apparently of greater importance than cell number in determining muscle size.
6. Muscle cell number at hatching and cell size at ten weeks of age appeared to be controlled primarily by additive gene action.

Microfilm \$2.50; Xerox \$7.40. 157 pages.

STUDIES OF CHROMOSOME PAIRING IN MAIZE BY USING INTERCHANGES INVOLVING THE SAME TWO CHROMOSOMES

(L. C. Card No. Mic 60-950)

Mamoru Tabata, Ph.D.
University of Minnesota, 1959

Adviser: C. R. Burnham

Observations on pairing at meiosis in intercrossoes between a series of translocations involving the same two chromosomes with different break points were made to obtain information on the forces governing pairing. Interchanges between chromosomes 2 and 6, 3 and 6, and 6 and 9 were used. Of the seventeen intercross combinations studied, four belonged to type 1a (breaks in both chromosomes in opposite arms); eight to type 1b (breaks in one chromosome in opposite arms and in the same arm in the other chromosome); and five to group 2 (the breaks in both chromosomes in the same arm).

At pachytene in type 1a and in group 2 intercrossoes the ends of chromosomes usually showed complete homologous pairing whether in 'pairs' or in an association of four chromosomes. The intercalary segments showed extensive non-homologous association or asynapsis. Likewise in type 1b intercrossoes, the ends were associated in the 04 configurations. In none of these intercrossoes did the centromeres play any significant role in pairing. Hence pairing in maize usually begins at the ends

of chromosomes, although it may start occasionally at any point along the chromosomes. The intercalary segments are at a definite disadvantage in pairing.

In certain intercrossoes the frequent failure of pairing in the short terminal segment or satellite translocated to other chromosomes was correlated with complete pairing in the adjacent intercalary region, indicating the importance of end regions in controlling the behavior of other regions.

Association initiated between two homologous regions continues to proceed along the chromosome in a zipper-like manner, often bringing about an association of non-homologous parts, until it is prevented by a counter association from the opposite direction.

The results of genetic linkage tests and spore quartet analyses showed good agreement with the pachytene behavior of the chromosomes. The regions in which homologous pairing encounters difficulty owing to non-homologous association or asynapsis is reflected in reduced or no detectable crossing-over.

Diakinesis configurations of the interchanged chromosomes in the intercrossoes were as follows: in type 1a, except where an interchanged end segment is a satellite or a very short piece, there was a high frequency of two 'pairs'; in type 1b, all or nearly all were associations of four; in group 2, a high frequency of all were two 'pairs'. With the one exception in type 1a showing all 04 (the one in which an interchanged end was a satellite), type 1b intercrossoes can be distinguished from the other two types based on examination at diakinesis alone. The high frequencies of 'pairs' in type 1a and group 2 as well as the high frequency of associations of four in type 1b would be ascribed to the preferential pairing of the homologous ends of chromosomes over the intercalary segments.

Unusually high frequencies of adjacent 2 segregation from the associations of four chromosomes were found in two type 1a intercrossoes. At present it is difficult to account for these high percentages.

In type 1a intercrossoes, a viable set of chromosomes with new combinations of the chromosomal segments may be derived from the simultaneous occurrence of crossing-over in the two 'between breaks' segments in the complex of four chromosomes. In this set in otherwise normal chromosomes the centromere-bearing 'between breaks' segment of one chromosome would have been exchanged with that of the other chromosome.

Microfilm \$2.50; Xerox \$7.00. 148 pages.

THE EFFECT OF NUTRIENT DENSITY AND NUTRIENT INTERRELATIONSHIPS ON THE REPRODUCTIVE PERFORMANCE OF CHICKENS

(L. C. Card No. Mic 60-1219)

Paul Sherman Touchburn, Ph.D.
The Ohio State University, 1959

The importance of nutrient interrelationships has recently been emphasized. The term Calorie/protein (C/P) ratio is used to represent the relationship of energy to protein. An optimum C/P ratio has not been established for laying chickens. The term nutrient density was de-

veloped to describe the changes in the concentration of individual nutrients when they maintain a constant relationship to each other. There is a need to establish the validity of productive energy values in modern rations for the laying hen. Metabolizable energy values, estimated on the basis of digestibility data, need to be tested.

Experiments were conducted with egg production-type laying pullets. The first year rations contained 12, 14, 16, 18 and 20 per cent protein with productive energy levels of 720, 840, 960, 1080 and 1200 Calories per pound respectively (C/P = 60). In the second year the second diet was replaced by a 12 per cent protein--960 Calorie diet (C/P = 80), and the fourth diet was replaced by a 16 per cent protein--1200 Calorie diet (C/P = 75). In the third year the ration with the C/P ratio of 75 was replaced by a ration composed of equal parts of the lowest and highest density rations. It was calculated to be equal in nutrient composition to the 16 per cent protein--960 Calorie ration. In all rations the animal protein, vitamins, and minerals were provided in proportion to the total protein content.

The rate of egg production was not significantly affected by the nutrient density of the diet. A C/P ratio of 80 caused a decreased egg production, except during cold weather. A C/P ratio of 75 did not depress egg production. The efficiency of feed utilization for egg production increased as the nutrient density of the diet increased. In the most concentrated diet, however, the relative efficiency was poorer than expected. This was shown by restricted feeding technique to be due to overconsumption of this highly concentrated diet. Reasons for the overconsumption may have been (1) that since a large proportion of the total calories was supplied by fat, the blood glucose level was not raised sufficiently to satisfy appetite; (2) that the highly concentrated nature of the diet did not provide adequate physical stimulus in the digestive tract to satisfy appetite.

On the other rations the intake of energy was found to regulate feed consumption. Consequently the decreased production with a wide C/P ratio of 80 was the result of a suboptimal intake of protein.

The daily protein intake required for 72 per cent production was slightly greater than 4.1 grams per pound of body weight. As protein intake became limiting, the order in which factors were affected was egg weight, egg production, body weight.

An increase in dietary fat level caused increases in egg weight and in body fat deposition. High levels (20 per cent) of fat in the diet were well utilized and did not cause derangement of fat metabolism.

A large part of the extra body weight acquired by hens receiving the rations of highest nutrient density was found to be a non-labile permanent increase in body tissue.

Energy from fat in the diet was utilized as well as that supplied by carbohydrate. The presence of fiber in the diet did not depress the efficiency of nutrient utilization. Experimentally determined metabolizable energy values for the rations agreed very closely with the calculated values. The similar results obtained for the two comparable rations formulated from different feedstuffs indicate that the productive and metabolizable energy values assigned to the major ingredients adequately predict the efficiency with which they will be used for egg production.

Microfilm \$2.50; Xerox \$6.40. 133 pages.

THE PARAMUTAGENIC ACTION OF THE MARBLED ALLELE IN MAIZE

(L. C. Card No. Mic 60-1028)

Willem Hendrik Weyers, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor R. A. Brink

Previous observations have disclosed that the pigment-producing action of the R^r allele (colored aleurone, red seedling) in maize invariably is reduced among the offspring of heterozygotes with R^{st} (stippled aleurone, green seedling) and R^{mb} (marbled aleurone, green seedling). The altered forms of R^r are transmitted through subsequent generations and are therefore heritable.

This phenomenon has been termed paramutation. The R^r allele is said to be paramutable, while the R^{mb} and R^{st} alleles are described as paramutagenic. The genetically modified forms of R^r , designated $R^{r:mb}$ and $R^{r:st}$, are referred to as paramutants.

Further studies on the marbled allele and its paramutagenic action form the subject of this report.

R^g mutants (colored aleurone, green seedling) from R^r were shown to be similarly paramutable in heterozygotes with R^{mb} . When pollen from $R^{g:mb} R^r$ plants was applied to $r^g r^g$, the resulting $R^{g:mb} r^g$ kernels were less pigmented on the average than the $R^r r^g$ segregates. The paramutant form $R^{r:mb}$ and the R^g allele likewise persisted as distinct classes in the testcross progeny of $R^{r:mb} R^g$ heterozygotes. Since R^r and R^g are similar both in pigment-producing action and in paramutability in heterozygotes with R^{mb} , the results demonstrate that the difference between the unaltered alleles (R^r and R^g) and their paramutant forms does not reside in the cytoplasm, but follows the chromosomes in distribution to the offspring. This conclusion is further supported by the observation that the capacity to alter R^r is transmitted with the R^{mb} gametes, but not with the r^r gametes of an $R^{mb} r^r$ heterozygote.

Selection among the testcross offspring of a single $R^r R^{mb}$ plant resulted in the isolation of $R^{r:mb}$ paramutants with different pigment-producing capacities.

Selection within the uniform W22 inbred line in which marbled was incorporated yielded marbled sub-lines differing in paramutagenic competence. It was observed also that the capacity of R^{mb} to alter standard R^r could be reduced by first passing the marbled allele through a heterozygote with stippled. Five independent self-colored mutants from marbled, on the other hand, retained the paramutagenicity of the parent R^{mb} allele.

Paramutability of R^r in heterozygotes with marbled was greatly reduced by placing the allele in coupling with a large terminal heterochromatic knob. The return of the R^r from the knob-carrying chromosome to a normal chromosome, by crossing-over, resulted in an increased sensitivity to paramutation in $R^r R^{mb}$ heterozygotes.

Attempts to change the amount of aleurone spotting in marbled plants by selection resulted in the isolation of marbled families which differed not only in grade of marbling, but also in rate of mutation to self-color. Marbled sub-lines which exhibited extensive aleurone pigmentation, also showed high frequencies of germinally transmissible mutations to self-color. The differences between the various sub-lines with regard to aleurone spotting persisted in recurrent matings to the W22 $r^r r^r$ (colorless aleurone, red seedling) inbred strain.

A light marbled family was tested for frequency of mutation to self-color both in homozygotes and in heterozygotes with r^r . The mutation rates in the homozygotes and heterozygotes were 0.0 per 10^4 and 6.8 per 10^4 gametes respectively.

Two marbled W22 sub-lines differing in degree of aleurone spotting and rate of mutation to self-color proved to be indistinguishable in paramutagenic action.

The findings related above provide evidence of the specific induction of intrachromosomal changes in, or near, the R locus in corn by certain allelic factors in heterozygotes. Microfilm \$2.50; Xerox \$4.80. 93 pages.

BOTANY

STUDIES OF THE INFLUENCE OF TEMPERATURE AND LIGHT INTENSITY UPON CERTAIN PHYSIOLOGICAL PROCESSES IN WHITE CLOVER

(L. C. Card No. Mic 60-1234)

Ernest George Beinhart, Jr., Ph.D.
Duke University, 1959

Supervisor: Paul J. Kramer

White clover usually does not persist in permanent pastures in the southern United States. These studies were undertaken to determine physiological responses to temperature and light intensity which may be related to field persistence.

Experimental plots in which foliage was cut to one inch heights during July and August, or August alone, retained greater clover populations than plots cut to three inch heights in these months. Close cutting resulted in higher maximum and average temperatures in stolons, while leaf temperatures were only slightly affected by cutting height.

Plant responses to different temperatures and light intensities were studied in growth chambers. In one experiment, plants grew at low light intensity (575-640 foot-candles) with all combinations of 50°, 62°, 74°, and 86°F as day and night temperatures. A second factorial experiment compared responses to three light intensities (575, 935, and 2,000 foot-candles) and three night temperatures (50°, 62°, and 86°F) at an 86°F day temperature. Plants in both experiments received 14.5 hours of light per day.

Leaf production, leaf mortality, leaf diameter, petiole length, and flower production were measured. Plants were harvested after six weeks in the growth chambers and dry weights of leaves, stolons, and roots were obtained for each treatment.

Day and night temperatures and light intensity affected all responses measured. At low light intensity, mean total dry weights showed highly significant differences between day temperatures, the order being $74^{\circ} = 62^{\circ} > 86^{\circ} > 50^{\circ}\text{F}$. A regression of total dry weight on average leaf area present during the experimental period accounted for 90 per cent of the variations in dry weight. It was concluded that temperature affects the growth of white clover by altering the rate of production of leaves, their size, and their life span.

Mean dry weights of plants at 86°F day temperatures increased from 0.309 to 1.240 grams as light intensity increased from 575 to 2,000 foot-candles. Assimilation rates were greater at the two higher light intensities than at the lowest. Leaf weight increased as a percentage of total dry weight as temperature increased, while root percentage declined. The percentage of total dry weight as stolons was only slightly influenced by temperature, but nearly doubled when light intensity increased from 575 to 935 foot-candles.

Apparent photosynthesis and respiration rates were measured over a range of temperatures. Predicted assimilation rates based on these measurements were compared with assimilation rates of plants in the growth chamber. Predicted and actual rates agreed closely for plants at high and medium day temperatures. At 50°F day temperatures, actual assimilation greatly exceeded the predicted, suggesting that plants attained higher photosynthetic rates than those shown by short term measurements.

When dry weights of plants grown at 86°F day temperatures were related to total leaf area produced, rather than average leaf area present, dry matter gain per unit of leaf area was constant over all light intensities. Greater assimilation rates were offset by decreased life spans of leaves at the higher light intensities. Therefore, the greater dry weights of plants at higher light intensities were due to greater leaf area production, rather than to higher assimilation rates. Increased leaf area production due to high light intensity may account for the value of close cutting under summer field conditions.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

TAXONOMY AND REGIONAL VARIATION OF OXALIS SECTION CORNICULATAE

(L. C. Card No. Mic 60-1135)

George Eiten, Ph.D.
Columbia University, 1959

Based on a study of about 10,000 herbarium specimens in over 7000 collections, on herbarium material of related sections, on fieldwork in northeastern United States and central Mexico, and on cultivated material, the section *Corniculatae* of *Oxalis* (*Oxalidaceae*) is revised to include 14 species in two subsections. Two of the species have three, and one has two, well-defined subspecies. Subsec-

tion *Corniculatae* includes: (1) the widely-distributed weed, *O. corniculata*; the South American endemics, (2) *O. sexenata* of lowland temperate regions, and the Andean species (3) *O. bisfracta*, (4) *O. calachaccensis*, (5) *O. filiformis*, and (6) *O. rufescens*; the West Indian endemics, (7) *O. Rugeliana* and (8) *O. thelyoxys*; the mainland North American endemics, (9) *O. Dillenii* with two weedy subspecies, *Dillenii* and *filipes* in the east, (10) *O. Priceae* with three subspecies, *texana*, *colorea* and *Priceae* in the southeast, and (11) *O. albicans* with three subspecies, *albicans* of Guatemala, Mexico, Arizona, New Mexico and western Texas, *pilosa* of California, Arizona and northern Mexico, and *californica* of southwestern California and Baja California. Subsection *Strictae* includes (12) the weedy *O. stricta* of eastern North America and northeastern Asia, and introduced in Europe, (13) *O. Suksdorfii* of western Oregon and adjacent Washington and California, and (14) *O. grandis* of eastern United States, mostly south of the terminal moraine but absent from the Coastal Plain.

Oxalis corniculata and *O. sexenata* are each left as monotypic species, although more material may prove each to be composed of more than one species or subspecies. The highly variable *O. stricta* is not divided into subspecies since the variation is regionally too intergrading or erratic.

Due to the large number of collections seen from North America, an intensive account of regional variation is given for *O. stricta* and *O. Dillenii*. A more generalized account of regional variation is given for the world-wide *O. corniculata*. Under each species numerous questions of typification of names are discussed, a synonymy as complete as possible is provided, and the species' morphological distinction from related species is taken up. The introduction provides information on the delimitation of section *Corniculatae* from related sections in *Oxalis*, on heterostyly in the section and the genus, on the host relationships of species of the section with the rust fungi that cause diseases of maize and sorghum, and on the phylogeny of the section. Previously reported chromosome numbers are repeated and new ones given for *O. corniculata*, *O. Dillenii* ssp. *Dillenii*, *O. D.* ssp. *filipes*, and *O. stricta*. A key is provided to species and subspecies.

No new taxa are described. Actually, subsection *Strictae* Eiten represents a new concept, but for technical reasons must be considered only a new name and status for the genus *Xanthoxalis* Small. New combinations, all status *novi*, are: *O. albicans* ssp. *californica* (Abrams) Eiten, *O. albicans* ssp. *pilosa* (Nutt.) Eiten, *O. Dillenii* ssp. *filipes* (Small) Eiten, *O. Priceae* ssp. *colorea* (Small) Eiten, and *O. Priceae* ssp. *texana* (Small) Eiten.

Microfilm \$4.95; Xerox \$17.35. 385 pages.

POLLEN GRAIN MORPHOLOGY AND
ITS TAXONOMIC SIGNIFICANCE IN THE
AMHERSTIEAE, CYNOMETREAE, AND
SCLEROLOBIEAE (CAESALPINIACEAE) WITH
SPECIAL REFERENCE TO AMERICAN GENERA.

(L. C. Card No. Mic 60-331)

Sister Mary Veronica Fasbender, O.S.B., Ph.D.
St. Louis University, 1959

The tribal limits of three Caesalpiniceous tribes, the Amherstieae, Cynometreae, and Sclerolobieae, are controversial. Various characters have been used to delimit the tribes and a taxonomic fusion of the three tribes has likewise been suggested.

A palynological investigation of 203 species of 61 genera was carried out with a view of ascertaining somewhat more accurately tribal limits, generic relationships, and in 7 American genera, interspecific relations.

The investigation included microscopic investigation of acetolysed exines mounted *in toto* and of ultrathin sections of exines which were prepared by embedding in plastic and cutting with a glass knife fitted into a microtome adapted for cutting thin sections. Analysis of pollen characters was aided by the use of pictorialized scatter diagrams. Palynograms of the pollen of 67 species were prepared.

Palynologically *Sclerolobium*, *Tachigalia*, and *Crudia* are homogeneous. The heterogeneity of the pollen of *Dicymbe*, *Eperua*, *Brownea*, and *Peltogyne* suggests certain interspecific groupings.

The pollen of the Cynometreae, which is the least specialized of the tribes, is small and differentiated into two types, a striate and psilate. The striate type offers supportive evidence for the close relationship of *Aphanocalyx*, *Gilletiodendron*, *Cryptosepalum*, *Scorodophloeus*, *Talbotiella*, *Plagiosiphon*, *Monopetalanthus*, and *Cynometra* (some African species). The psilate type characterizes 10 genera: *Copaifera*, *Gossweilerodendron*, *Hardwickia*, *Kingiodendron*, *Oxystigma*, *Prioria*, *Pterogyne*, *Guibourtia*, *Pseudocopaiva*, and *Cynometra* (some African and American species) and reaffirms the close affinity of these genera.

The basic reticulate type of the Sclerolobieae is intermediate between the pollen of the other two tribes both in sculpturing and size. This basic type marks *Sclerolobium*, *Vouacapoua*, *Melanoxylon*, *Recordoxylon*, *Batesia*, and with some differentiation, *Phyllocarpus*, *Poeppigia*, and *Diptychandra*.

The Amherstieae, being most highly evolved palynologically, are marked by a diverse assortment of shapes, sizes, and sexine patterns: reticulate, striate, verrucate, psilate, rugulate, clavate baculate, retipilate, and ornate. The last three types are confined to *Eperua* which in pollen characters is the most exotic of all of the genera.

A very coarsely reticulate pollen links *Pahudia*, *Intsia*, and *Afzelia*, a relationship which has long been recognized by taxonomists. A distinctive reticulate pattern segregates several individual genera: *Sindora*, *Tachigalia*, *Baikiaea*, and *Brachystegia*. Verrucate pollen marks *Elizabetha*, *Palovea*, *Brownea disepala*, and *Peltogyne* (some species) and supports the recognized relation among the first three genera.

Striate pollen marks 11 genera: *Amherstia*, *Berlinia*, *Macrolobium*, *Didelotia*, *Saraca*, *Crudia*, *Heterostemon*,

Oddoniodendron, and one species of *Schotia* as well as *Gilbertiodendron*, and *Isoberlinia* which were described by other investigators.

Palynological evidence supports the retention of three distinct tribes based on the character originally used in defining the three tribes i.e. the fusion or non-fusion of the ovary to the wall of the receptacle.

Pollen characters suggest the transfer of certain genera from one tribe to another: *Dicymbe* (Sclerolobieae) to the Amherstieae, *Maniltoa* and *Neochevalierodendron* (Cynometreae) to the Amherstieae, and *Hylodendron* and *Tachigalia* (Amherstieae) to the Cynometreae and Sclerolobieae respectively. *Cenostigma* (Sclerolobieae) and *Stahlia* (Cynometreae) are palynologically related to *Caesalpinia* (Eucaesalpinieae).

A relationship is noted between pollen characters and the geographical distribution of the genera. The verrucate type is entirely restricted to the New World genera. The striate type with two exceptions is limited to Old World genera. Microfilm \$2.50; Xerox \$8.20. 180 pages.

STUDIES ON CHANGES IN PLASTIDS
AND OTHER CELL PARTICLES DURING
GREENING OF THE TOBACCO LEAF

(L. C. Card No. Mic 60-1236)

Joseph Belknap Harris, Ph.D.
Duke University, 1959

Supervisor: Aubrey W. Naylor

A time-course study showed the effects of light, leaf age, leaf excision, and nutrient solution on the development of plastids and other cell particles in the etiolated tobacco leaf.

Structural changes in cell organelles identified as plastids were followed with the light microscope during their development in white light. Internal developmental changes were followed by fixation and staining. Plastids were distinguishable from other cell organelles after four hours' light by the ability to form an apparently limiting membrane, presence of both starch grains or vacuoles, and four to eight deeply-staining *Granascheibchens*. On continued exposure there was an enlargement of starch grains and an apparent coalescence of the granules into a primary granum. After 36 hours the plastid size had increased from about one to two microns in thickness and four to five microns in length. In young leaves developing under greenhouse conditions, chloroplasts contained few or no starch grains but showed many prominent grana. Thus, a considerable amount of internal differentiation, paralleled with a loss of starch, followed after 36 hours of continuous light. Starch grains reappeared in plastids of mature leaves.

The growth rate of plastids was irregular and could not be correlated with either the chlorophyll or nitrogen changes in these particles. It is possible that, in the relatively early stages of growth, changes in size were, in the main, due to the development of starch.

After exposure to optimal light intensity, cell organelles separated by fractional centrifugation at 5,000 and 50,000 x g., i.e., those classified as mitochondria and

microsomes, showed the greatest change in metabolic activity. These particles increased most rapidly in chlorophyll content, and, after an initial loss, they showed the greatest rate of synthesis or accumulation of B-carotene. The weight of the alcohol-ether insoluble fraction from these particles increased in the presence of light, as did that of larger cell organelles; likewise, total and percent nitrogen was higher due to light. This showed that particles of considerably smaller size than recognizable plastids (possibly a few of the numbers isolated were plastid fragments) not only contained the metabolic systems necessary for the elaboration of chlorophyll, but also produced both chlorophyll and carotene in greater amounts than did the larger particles. Due to light treatment, cell organelles maintained a higher protein nitrogen level, thus it appears that these particles contain both a system for light-stimulated nitrate reduction, and one for incorporation of nitrogen into protein. Particles sedimented at 500 and 1,500 x g. showed a relatively sluggish response to light; thus, during dark development, some of the light-sensitive mechanisms were interfered with. Cell organelles sedimented at 105,000 x g. increased in pigment which absorbed at 663 m μ as long as exposure was continued.

The aging process in etiolated leaves was investigated. Aging caused a loss of nitrogen and carotene from cell particles. Age phenomena also influenced the response of leaves to light. Thus, chlorophyll and carotene production was retarded, photosynthesis was delayed, and the level of protein maintained was lower. Old leaves responded to pretreatment in a nutrient and food solution, which was found to stimulate chlorophyll production, by generally increasing in particulate carotene and protene nitrogen. The particles which were sedimented at 50,000 x g., from old and young leaves alike, lost carotene and nitrogen during this treatment. Regardless of leaf age, excision from the shoot caused a loss of protein nitrogen and carotene from all but the largest cell organelles; usually, there was partial or complete recovery from this treatment. Microfilm \$2.50; Xerox \$6.40. 131 pages.

ECOLOGICAL STUDIES OF THE GROWTH OF PONDEROSA PINE ON THE EAST SLOPE OF THE ROCKY MOUNTAIN FRONT RANGE IN BOULDER COUNTY, COLORADO.

(L. C. Card No. Mic 60-1067)

Dexter Winfield Hess, Ph.D.
University of Colorado, 1959

Supervisor: Associate Professor John W. Marr

The purpose of this study was to describe in some detail the initiation, rate, and cessation of growth in ponderosa pine, and to correlate these three features of growth with certain environmental factors.

It is the first such growth study of ponderosa pine which has been made in this region utilizing both dendrometer and tissue-section methods. In addition to describing for the first time the gross features of growth at the one-meter level in the Front Range ecotype of this species some major correlations of this growth pattern with certain environmental factors have been pointed out.

The diameter growth in five individuals of *Pinus ponderosa* Laws. variety *scopulorum* was measured at the one-meter level for two consecutive seasons, at an elevation of 7,500 feet in the Lower Montane Zone in Boulder County, Colorado. Diameter measurements were made externally with a dial-guage dendrometer. These diameter measurements were supplemented by microscopic study of tissue cross-sections taken from the cambium and adjacent tissues. Measurements of the external environment of the pine stand were made with standard United States Weather Bureau equipment supplemented by special apparatus for the measurement of soil moisture.

Growth was initiated early in May in the trunk cambium at the one-meter level. This initiation of growth is correlated with the attainment of a 50° F. mean air and soil temperature. Fifty percent of the diameter increase was completed within thirty days. This is a more rapid growth rate than is found in other ecotypes of ponderosa pine. Growth rate was constant and apparently unaffected by the seasonal trend of rising temperature and decreasing soil moisture. Three rows of phloem parenchyma were produced in a single season in contrast to the white pine which produces only a single row of phloem parenchyma. Crushing of new sieve elements occurs as early as the latter part of June. Cessation of diametral growth is difficult to determine exactly but by the end of August growth seems essentially complete and cambial activity at an end. This cessation of diameter growth does not appear to be directly correlated with soil drought or lowering temperatures, and is apparently autogenous in its onset. Microfilm \$2.50; Xerox \$5.80. 118 pages.

BIOCHEMICAL AND PHYSIOLOGICAL ASPECTS OF ANTHOCYANIN SYNTHESIS IN DETACHED PETALS OF IMPATIENS BALSAMINA L.

(L. C. Card No. Mic 60-828)

Attila Otto Klein, Ph.D.
Indiana University, 1959

A method was developed for maintaining excised, immature petals in White's nutrient solution. Under these conditions the petals expanded and developed their normal complement of anthocyanin and flavonol pigments.

Of the three genotypes investigated pink, a dilute color type, produced ten times the normal quantity of pigments, while the two intensely colored genotypes, red and purple, produced about as much pigment per petal in culture as on the plant. Neither intentional injury nor premature exposure to light of pink petals remaining *in situ* could duplicate the increase caused by culture conditions.

Chromatographic comparison of cultured and *in situ* petals revealed several qualitative differences. Pink and red petals normally contain only pelargonidin and kaempferol derivatives, both of which have a single hydroxyl group on the B ring of the flavonoid nucleus. In culture cyanidin, peonidin, and quercetin are also produced. All of the latter compounds have a basic o-dihydroxy configuration on the B ring. In this respect cultured petals resemble intact sepals which also possess the same o-dihydroxy derivatives.

In purple petals which normally contain malvidin and kaempferol derivatives which have a tri- and monohydroxy

configuration, respectively, culturing again introduces cyanidin and possibly quercetin. The sepals of this genotype produce quercetin but not cyanidin.

The appearance of 3' - 4'- dihydroxy anthocyanins and flavonols in cultured petals is ascribed to the partial inhibition of biosynthetic steps which normally convert their common precursors to mono- and tri-hydroxy derivatives.

Evidence was obtained for the stepwise glycosidation of the major pelargonidin derivative in red flowers. Formation of the 3-glycoside was found to precede formation of the 3,5-diglycoside in the course of development.

Physiological experiments on petals developing in culture were aimed at determining the interrelation between cellular expansion, the disappearance of initially present chlorophyll, and anthocyanin synthesis. Mechanical injury was found to accelerate all three events. Kinetin (6-furfuryl-amino-purine) at 0.5 mg/l also increases expansion and anthocyanin synthesis and its effects are additive with those of injury. At osmotically active concentrations (1.0 - .25 M) mannitol inhibits anthocyanin synthesis more than it inhibits expansion. Triiodobenzoic acid (1.0 - 5.0 mg/l) causes a time gap between expansion and the appearance of anthocyanins showing that these two processes need not occur simultaneously. The amino acid analog ethionine (6×10^{-5}) causes radical reduction of expansion but not of anthocyanin synthesis. Higher concentrations are inhibitory to both. Petals from very young buds are more susceptible to ethionine inhibition than those from older buds. Kinetin stimulated increase in anthocyanin synthesis is erased by ethionine.

These results are interpreted to confirm the mediation of purine metabolism in anthocyanin synthesis. That this mediation may act through protein synthesis is shown by the kinetin - ethionine antagonism. It is suggested that there are several stages in the development of anthocyanin producing systems which differ in their dependence on protein synthesis. In early stages some, perhaps new kind, of protein must be formed while at later stages general protein synthesis represents competition for substrates. The triggering of the actual appearance of anthocyanins in petals may be a nutritional or hormonal condition which also results in rapid cellular expansion and the breakdown of chlorophyll. Anthocyanin in petals is considered an indicator of tissue senescence.

Microfilm \$2.50; Xerox \$5.00. 98 pages.

**PART I: A METHOD FOR ENUMERATING
FRESHWATER PHYTOPLANKTON
CONCENTRATED ON THE MEMBRANE FILTER.
PART II: A STUDY OF THE PHYTOPLANKTON
AND PHOTOSYNTHESIS IN SEWAGE
OXIDATION PONDS IN WISCONSIN.**

(L. C. Card No. Mic 60-1012)

Clarence Duncan McNabb, Jr., Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Richard Evans

Individuals of the phytoplankton become distributed at random when concentrated on the membrane filter. The

percentage of microscopic fields in which a species occurs may therefore be validly converted to a theoretical average number of individuals per field. The theoretical density thus obtained and the actual density determined by time-consuming counting are very nearly similar values when 25 or more fields are scored. An enumeration technique using this relationship is described in Part I. It has many advantages over commonly used procedures for concentrating the plankton and estimating the number of individuals in a sample.

The membrane filter technique was used in making a qualitative and quantitative study of the phytoplankton of sewage oxidation ponds that were recently constructed to serve three small communities in Wisconsin. Standard procedures were used to convert the enumeration data to an estimate of the volume of organic material contributed by each species to the total mass of phytoplankton. The standing crop of algae was analyzed at approximately four week intervals for 15 consecutive months.

Members of the Chlorococcales, Volvocales, and Euglenales formed blooms in the ponds. Dominant speciation in the different seasons of the year varied among the ponds. Total counts of phytoplankton were most often between 10,000 and 1,000,000 organisms per milliliter of sample. There was commonly from 50 p.p.m. to 250 p.p.m. of algae by volume in the impoundments during the spring, summer and fall months. This is considerably in excess of similarly calculated volumes reported from other aquatic habitats in the optimal growing season. The standing crop was sparse beneath the ice in winter.

A light and dark bottle experiment demonstrated that algal photosynthesis was restricted to the euphotic zone of a pond. This layer extended for a few inches into the water beneath snow and ice in winter and was generally from one to two feet deep in the months when the ponds were open.

Measurements of the oxygen concentration at various depths in the water column were made at regular intervals of time from dawn until dusk on days in late winter, spring and summer. These showed that the vertical distribution of dissolved oxygen originating from photosynthesis in the euphotic zone was dependent upon the degree to which the content of a pond was mixed by wind induced currents. Sharp vertical oxygen gradients were present under the ice in winter, and in the season of open water when temperature differences between the surface and bottom strata were of sufficient magnitude to give the water columns considerable stability or resistance to wind mixing.

The hourly rates of change in the oxygen content of the water columns of the ponds were estimated for various portions of the day. A maximum rate of change was typically observed in the hours of the morning and early afternoon. A sharply reduced oxygenation rate occurred in the late afternoon and evening. Diurnal variation in the photosynthetic rate appears to have been responsible for this.

A seasonal photosynthetic cycle, which causes fluctuation in the efficiency of sewage treatment in impoundments, was apparent from the data. The ponds were well aerated under optimal conditions of temperature and light that existed in summer and fall. Poor light transmission through snow and ice and low water temperatures caused a reduction in the photosynthetic rate in winter and

the ponds became anaerobic. The length of the period of recovery from winter stagnation varied among the ponds from a few days to about five weeks depending upon the speed at which the algae population expanded and reaerated the environment through photosynthesis.

Microfilm \$2.50; Xerox \$6.60. 139 pages.

**DIFFERENTIAL DISEASE DEVELOPMENT
AS A MEASURE OF ENTRANCE AND
MOVEMENT OF A FUNGICIDE WITHIN
CUCUMBER SEEDLINGS**

(L. C. Card No. Mic 60-1202)

Robert Winfield Metz, Ph.D.
The Ohio State University, 1959

The application of a plant disease-controlling chemical, one that would enter, move, and persist, to a part or parts of a plant would approach the ultimate in control. A bio-assay method was developed particularly for the evaluation of chemicals with the potential of entering and moving within plants. The evaluation was based on the differential development of leaf spots on the primary or second true leaf of cucumber seedlings following application of an antibiotic to a part or parts of the seedling prior to inoculation with a conidial suspension of *Colletotrichum lagenarium* (Pass.) Ell. and Halst.

Pleocidin, the antibiotic used in this research, was applied at concentrations from 10,000 to 10 ppm by spraying, or by brushing, or by brushing with Carborundum on the hypocotyl and cotyledons, or on primary leaf, or on second true leaf of each 12-22 day-old cucumber seedling. The time interval which elapsed between application of the antibiotic and inoculation of the seedlings varied from 24 to 72 hours. The seedlings were inoculated with a conidial suspension of *C. lagenarium* containing approximately 60,000 conidia per ml. After inoculation the seedlings were placed in a moist chamber for 36 hours, after which time symptoms developed within 3-5 days. The lesions were counted on either the primary or second true leaf.

When the antibiotic was brushed on the cotyledons and hypocotyl with an "acid brush" there was greater movement of the antibiotic into the primary leaf than when the antibiotic was sprayed on the cotyledons and hypocotyl. Under the same experimental conditions there was a greater movement when the antibiotic was brushed on with Carborundum than when the Carborundum was not incorporated.

There was a greater movement of the antibiotic from the second true leaves downward to the primary leaves than upward from the primary leaves to the second true leaves when the antibiotic was sprayed on 24 hours before the inoculation of the seedlings.

The degree of symptom suppression following an application of pleocidin diminished in excess of a 48-hour interval between the application of the antibiotic to the primary leaves or second true leaves and inoculation of the seedlings.

On the basis of the data, the antibiotic pleocidin enters and moves within cucumber seedlings, and the procedure used in this demonstration could be incorporated in pro-

grams concerned with the evaluation of chemicals as systemic pesticides.

Microfilm \$2.50; Xerox \$3.00. 50 pages.

**EFFECT OF GIBBERELIC ACID ON FRUIT
DEVELOPMENT OF THE APPLE, PEACH AND
PLUM; EFFECT OF GIBBERELIC ACID
ON GROWTH AND NITROGEN STATUS OF
APPLE SEEDLINGS.**

(L. C. Card No. Mic 60-1211)

Yahya Amin Salah, Ph.D.
The Ohio State University, 1959

Gibberellic acid was applied to fruits by different methods as follows: spray, injection, and in lanolin paste. There was no significant effect of either 100 or 200 ppm gibberellic acid applied as a spray or by stem injection on the developing fruits of the Stayman Winesap apple. Likewise, there was no significant effect of 200 ppm spray on the whole and cut (a portion of the fruit 0.5 to 1.0 cm² and 0.2 cm deep was removed) fruits. However, 1 per cent lanolin paste of gibberellic acid significantly increased the diameter of whole and cut fruits.

One application of gibberellic acid spray was not significantly effective on the growth of the whole and cut Halehaven peach fruits, while one application of 200 ppm significantly increased the diameter of whole fruits temporarily. An application of 100 ppm spray followed by a second application of 200 ppm resulted in a reduction in the rate of growth in diameter of whole and cut fruits. Thus, repeated applications of gibberellic acid depressed the growth of peach fruits. Stanley plum fruits were not affected by 100 ppm gibberellic acid application.

One hundred and ninety-two one-year-old apple seedlings were planted on April 20, 1958, each in a glazed earthenware crock filled with gravel and placed in a greenhouse. Three nitrogen levels — zero, medium, and high — and four gibberellic acid concentrations — 0, 150, 300, and 600 ppm — were employed in a randomized complete block design with a factorial arrangement of treatments. Gibberellic acid was applied as a spray three times at five-week intervals.

Gibberellic acid increased the rate of shoot elongation of seedlings grown under the three nitrogen levels for a few weeks following the first application. However, the most outstanding increase was in seedlings grown under the zero nitrogen level. Moreover, the effect on seedlings grown under the zero nitrogen level extended over a longer period of time than on seedlings grown under the medium and high nitrogen levels. Leaves which unfolded during a week following the first application exhibited a toxic effect. They were small in size, narrow, and pointed at the tip. In some leaves, the edges dried, curled, and turned to a brownish color. This toxic effect was less pronounced after the second and third applications. In seedlings grown under the medium and high nitrogen levels, the rate of shoot growth after the second and third applications of the various gibberellic acid concentrations was generally lower than that of seedlings which received no gibberellic acid treatment. Final shoot length

was not significantly affected. Gibberellic acid treatment significantly increased the shoot diameter and number of lateral shoots in seedlings grown under the zero nitrogen level. In seedlings grown under the medium and high nitrogen levels, repeated applications of higher concentrations resulted in smaller shoot diameters and an increase in the number of lateral shoots.

The dry weight of shoots of seedlings grown under the zero nitrogen level was significantly increased and that of the root significantly decreased as a result of gibberellic acid treatment. Under the medium and high nitrogen levels, three applications of the various gibberellic concentrations resulted in a marked reduction of the dry weight of roots; and with the increase in the gibberellic acid concentration there was a decrease in the dry weight. The dry weight of shoots was slightly reduced. Total nitrogen content of the upper leaves of seedlings grown under the zero nitrogen level was significantly increased by gibberellic acid treatment, while the total nitrogen content of the roots and shoots was significantly decreased. Thus, nitrogen was translocated from the lower parts of the plant to the upper growing tips. There was no apparent effect of gibberellic acid on the leaf nitrogen of seedlings grown under the medium and high nitrogen levels after the first treatment. However, after the second and third application, leaf nitrogen content was less than in seedlings which received no gibberellic acid.

Microfilm \$2.50; Xerox \$6.60. 138 pages.

THE COMPARATIVE MORPHOLOGY OF THE HERNANDIACEAE

(L. C. Card No. Mic 60-839)

Clarence Francis Shutts, Ph.D.
Indiana University, 1959

The angiospermous family, Hernandiaceae is generally considered to consist of Gyrocarpus, Sparattanthelium,

Illigera and Hernandia. Differences in the form of the floral organs and fruits indicate that this taxon is unnatural. In order to determine its relationships, studies were made of sections and/or diaphanized preparations of the wood, leaves, leaf nodes, pollen, flowers and inflorescences of representative species. In addition, the gross morphology of the fruits, and the distributions of the genera were investigated. These studies indicate that (1) the wood anatomy of the Hernandiaceae is more advanced than the wood of most other ranalean families; (2) the leaf nodes have unilacunar gaps; (3) the leaves of Gyrocarpus and Sparattanthelium possess epidermal cystoliths, ethereal oil cells in the spongy mesophyll and anomocytic stomata, whereas the leaves of Hernandia and Illigera lack epidermal cystoliths, the ethereal oil cells are present in the palisade mesophyll only, and the stomata are paracytic; (4) the pollen of Gyrocarpus and Sparattanthelium are distinctly different in size and sculpturing from that of Hernandia and Illigera; (5) the ovarian bundle arises opposite the dorsal stelar bundle in the flowers of Gyrocarpus and Sparattanthelium, whereas it branches from the dorsal stelar bundle in flowers of Hernandia and Illigera; (6) the inflorescences of Gyrocarpus and Sparattanthelium are compound dichasia, whereas the flowers of Hernandia and Illigera are borne in cincinni and helicoid cymes, respectively; (7) Gyrocarpus and Sparattanthelium originated in Africa or South America, whereas Hernandia and Illigera must have arisen in Australasia. These considerations indicate that Gyrocarpus and Sparattanthelium must be regarded as a separate family, the Gyrocarpaceae, and that the Hernandiaceae should be restricted to include only Hernandia and Illigera. Comparison with the morphology of other ranalean families as reported in the literature indicates that the Hernandiaceae sensu stricto is most closely allied to the Hortoniaceae and Monimiaceae of the Monimiaceae. In contrast, the Gyrocarpaceae should be regarded as a family with affinities to the Atherospermoideae and Siparunoideae of the Monimiaceae, the Gomortegaceae, and the Lauraceae.

Microfilm \$2.60; Xerox \$9.00. 198 pages.

CHEMISTRY

CHEMISTRY, ANALYTICAL

THE BENZENE EXTRACTION OF TIN (IV) IODIDE

(L. C. Card No. Mic 60-923)

Don Dale Gilbert, Ph.D.
University of Minnesota, 1959

The effects of temperature, ionic strength, acidity, and iodide and tin concentrations on the benzene extraction of tin (IV) iodide from aqueous media have been investigated, with special reference to quantitative analytical separation from tin.

The lack of hydrolysis constants for the stannic ion and complex constants of iodo-tin (IV) species prevents a full interpretation of the extraction data. Quantitative extraction ($\geq 99.8\%$) of milligram and microgram quantities of tin is obtained over a wide range of acid and iodide concentrations. Iodide concentrations as high as 5 M do not impair the extraction. There is evidence of polynuclear tin species in the aqueous phase but none in the benzene phase. The partition coefficient of SnI_4 ($K_p = [\text{SnI}_4]_{\text{C}_6\text{H}_6} / [\text{SnI}_4]_{\text{H}_2\text{O}}$) is at least 2000, and may well be larger.

The effect of 36 cations on the extraction and subsequent colorimetric determination of tin with phenylfluorone was investigated. Only four elements are known to accompany tin under any conditions: mercury (II), antimony, arsenic (III) and germanium. At relatively high iodide concentrations (2.5 M), mercury and antimony are not extracted and only small amounts of arsenic and germanium accompany tin. As little as two micrograms of tin can be quantitatively separated from 100 milligrams of iron (III).

Quantitative extraction of a few micrograms of tin from 20 ml of 0.5 M sulfate is readily obtained even though tin forms sulfato complexes. While 0.5 M phosphate has no significant effect on the extraction, oxalate (4×10^{-3} M) hinders the extraction of tin. However, oxalate is easily destroyed with permanganate. Fluoride and chloride (0.1 M) prevent quantitative extraction of tin. The former can be volatilized by evaporation with sulfuric acid, with no loss of tin, and the latter probably can be eliminated similarly. It is believed that the iodide extraction can often be used in place of the longer bromide distillation for the separation of microgram or milligram quantities of tin.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

CHEMISTRY, BIOLOGICAL

A STUDY OF INHIBITORS AND ENHANCERS OF IMMUNE HEMOLYSIS

(L. C. Card No. Mic 60-1129)

Kenneth Amiraian, Ph.D.
Columbia University, 1959

The lysis of sensitized sheep red cells (EA) by guinea pig, pig and human complements was inhibited by sheep serum. Fractionation of sheep serum by column electrophoresis revealed three fractions located among the globulins which were more inhibitory than the rest. A study of the role of these inhibitors in immune hemolysis showed that they played no part in the sensitization of erythrocytes. When cells in the state EAC'1,4,2 were prepared with guinea pig complement (gp C') in the presence of sheep serum, the activities of C'1, C'2 and C'4 of these cells were slightly decreased. Sheep serum inhibited predominantly the lysis of EAC'1,4,2 by gp C'3 in the presence of disodium ethylenediaminetetraacetate (EDTA).

In studying the inhibition of the lysis of EAC'1,4,2 by C'3 it was observed that the extent of lysis of EAC'1,4,2 by C'3 depended upon the source of C'3. The limiting extent of hemolysis of EAC'1,4,2 by pig serum in the presence of EDTA was greater than that by guinea pig serum. This difference cannot be attributed to the presence of inhibitors in guinea pig serum since the extents of hemolysis obtained with low concentrations of guinea pig serum were greater than with comparable concentrations of pig serum. Pig R1 and R4 reagents (lacking C'1 and C'4 respectively) and heated pig serum (having no C'1 and C'2 activity) gave limiting extents of hemolysis greater than that of guinea pig serum. The existence of another component, C'x, is proposed to account for these differences. Actually, separation of pig serum by column electrophoresis produced two fractions which did not hemolyze EAC'1,4,2 in the presence of EDTA but enhanced the lytic activity of guinea pig serum in such a system.

Casein and egg albumin, as well as the peptides, H-Gly-Tyr-OH (L) and H-Tyr-Gly-OH (L), inhibit gp C'. H-Gly-Tyr-OH (L) has no irreversible action on either C' or EA because no inhibition results if the peptide is first incubated with either C' or EA and then removed.

Indole-3-acetic acid, a known inhibitor of carboxypeptidase, inhibited gp C'. Carboxypeptidase was therefore tried; it increased the rate and extent of hemolysis of EA by gp C'. Maximum activation was obtained when carboxypeptidase was preincubated with complement. The enzyme did not affect the lysis of EAC'1,4,2 by gp C' in the presence of EDTA but enhanced the efficiency of gp C' in the formation of EAC'1,4,2. In addition, the presence of Mg^{++} was required for activation by the enzyme, thus implicating C'2. Ca^{++} and Mg^{++} gave a further increase. Through the use of classical reagents it would appear that C'4 is also involved. Microfilm \$2.50; Xerox \$4.20. 80 pages.

THE MECHANISM OF PROTEOLYTIC ENZYMES:
REACTION OF CHYMOTRYPSIN WITH
NITROPHENYL ACETATES.

(L. C. Card No. Mic 60-849)

Elias Steelo Awad, Ph.D.
University of Washington, 1959

Chairman: Dr. Hans Neurath

The reaction of δ -chymotrypsin with p-nitrophenyl acetate (NPA) and 2,4-dinitrophenyl acetate (DNPA) has been studied kinetically. This study was made within the framework of investigations on the mode of action of proteolytic enzymes. A survey of the kinetic data in the literature revealed, in general, good agreement in the work of different investigators, although diverse reaction conditions and approaches were used. In the reaction of chymotrypsin with nitrophenyl acetates three kinetic steps may be distinguished: (i) the formation of a Michaelis complex, (ii) the formation of an acyl enzyme intermediate with the liberation of nitrophenol, (iii) the breakdown of the acyl enzyme with regeneration of free enzyme and formation of acetate. Variables connected with the reaction of chymotrypsin and NPA were first studied. The apparent K_m describing the dependence of the turnover rate on NPA concentration was found to be 4.6×10^{-5} M. Next, the effects of some organic compounds (methanol, ethanol, n-propanol, isopropanol, n-butanol, t-butanol, cyclohexanol, sucrose, phenol, resorcinol, acetone, 2-butanone, 1,4-dioxane, methyl acetate, acetonitrile, urea, pyridine) and in particular indole and β -phenyl propionate were investigated quantitatively. The general effect of the organic compounds on the enzymatic reaction was to depress the acylation rate and to increase the turnover rate. Constants describing these effects have been calculated. The data give evidence that the organic compounds used bind to the enzyme and to the acyl enzyme with a firmness depending on the similarity of their structure to a six-membered carbon ring. Indole and β -phenyl propionate are competitive inhibitors to the acylation reaction, but function as activators of the turnover reaction. The kinetic data for the activation phenomenon give evidence that indole and β -phenyl propionate are bound to the acyl enzyme in the form of a complex, whereupon the complex breaks down to regenerate free enzyme at a faster rate than the uncomplexed acyl enzyme. Dissociation constants have been calculated for both the enzyme inhibitor complex in the acylation reaction and for the acyl enzyme activator complex in the turnover reaction. These dissociation constants are found to be of the same magnitude as the inhibition constants, K_i , of indole and β -phenyl propionate acting in the system chymotrypsin and acetyl-L-tyrosine ethyl ester. Both the acylation and the turnover reactions are pH dependent. For δ -chymotrypsin reacting with NPA the pK for the acylation at 5° was found to be 7.0; the pK for the turnover at 25° was 7.3. For δ -chymotrypsin reacting with DNPA the activation energy for the turnover reaction was found to be 12.6 kcal/mole and the corresponding entropy of activation -24.2 cal/deg at 25°. The heat of ionization for the group controlling the turnover rate of δ -chymotrypsin and DNPA was found to be 9.5 kcal/mole with an entropy change of -1.7 cal/deg at 25°. The pH and temperature dependence are good evidence for the participation of a histidine residue. Evidence for the participation of hydroxide ion in the

turnover reaction was found with both NPA and DNPA as substrates. Picryl acetate did not react with δ -chymotrypsin enzymatically. The mechanism of chymotrypsin catalysis is discussed in the light of the available evidence. Microfilm \$2.50; Xerox \$6.40. 135 pages.

STUDIES ON PANCREATIC LIPASE

(L. C. Card No. Mic 60-850)

Edward J. Barron, Ph.D.
University of Washington, 1959

Chairman: Donald J. Hanahan

A column chromatographic procedure was developed for the separation of neutral lipides. Silicic acid was used as the adsorbent and n-hexane as the major solvent. By use of 15% benzene in hexane, and then different concentrations of ether in hexane, separation of all the neutral lipides of mammalian tissues may be obtained.

Partial purification of dog pancreatic lipase was obtained by column chromatography on carboxy-methyl cellulose. Attempts at further purification of the enzyme obtained from the column were in general not successful. Some properties of the partially purified enzyme were investigated. Among the more important findings was that calcium ions are apparently directly involved in the catalytic process carried out by the enzyme. Also, the sulfhydryl groups of the enzyme must be free in order for it to maintain its activity.

It was also demonstrated that the migration of the acyl group of 2-monoglycerides which normally occurs during lipolysis can occur in the absence of the enzyme. The migration readily occurs at the pH usually used for the lipolysis reaction and the presence of calcium ions causes an acceleration of the migration.

The purified lipase, which attacks specifically the primary ester sites of triglycerides, was used to determine the location of different types of fatty acids in beef and rat liver triglycerides. It was shown that the 2-position of these triglycerides contained only unsaturated fatty acids. This finding was correlated with the known structure of liver phosphoglycerides and their metabolic relationship was discussed. Microfilm \$2.50; Xerox \$5.40. 107 pages.

STUDIES ON A MODIFIED FAT

(L. C. Card No. Mic 60-557)

Richard David Coleman, Ph.D.
University of Southern California, 1959

Chairman: Professor Alfin-Slater

Acetostearin, a new type of fat product containing mixed glycerides of acetic acid and long chain saturated fatty acids, has been investigated by employing many varied nutritional, biochemical, and histological criteria.

In studies on rats, growth was markedly retarded in animals fed acetostearin as the sole fat at relatively high

levels. It was considerably improved in animals supplemented with linoleate and markedly improved when cottonseed oil was fed with the acetostearin. Mortality was high in groups fed acetostearin alone, but decreased when acetostearin diets were supplemented with a source of essential fatty acids.

The rate of absorption of acetostearin was inferior to that of cottonseed oil when fed alone, due in part to an increased retention time in the stomach and the high melting point of the product. The absorption coefficient of an acetostearin product of lower melting point was within normal limits. The absorption rate of the high melting acetostearin improved when cottonseed oil was administered simultaneously.

The digestibility coefficients of mixtures of acetostearin and cottonseed oil, fed at a constant dietary level, decreased linearly as the level of acetostearin in the diet was increased. However, the digestibility of acetostearin, when fed alone, was considerably lower than would be predicted from this linear relationship. Fecal lipid analyses revealed that cottonseed oil increased the absorption of the stearic acid resulting from lypolysis of acetostearin. That the enzymatic digestion of acetostearin proceeds in the absence of cottonseed oil was shown by the considerable amounts of soaps and free fatty acids present in the feces.

Although saturated fats have been reported to interfere with calcium absorption, the results of a balance study indicated no increased fecal excretion of calcium and no decreased retention of this mineral in animals fed acetostearin, even when fed as the sole fat. Therefore, the marked osteoporosis observed in animals fed acetostearin alone cannot be attributed to an interference with calcium absorption.

Cholesterol analysis on tissues of rats fed acetostearin as the sole fat revealed a decrease in the plasma cholesterol level and an increase in the cholesterol in the liver; these changes were qualitatively the same as those observed in essential fatty acid deficiency. Elevations in adrenal cholesterol which were observed in the acetostearin-fed animals were comparable to those observed in animals fed either cottonseed oil or fat-free diets in restricted amounts. This suggests that essential fatty acid deficiency and caloric restriction are the responsible factors.

Gross abnormalities, known to occur in essential fatty acid-deficient animals, were observed in rats fed acetostearin alone. However, the pathology was more varied, was more severe, and occurred at an earlier time than the pathology in the fat-deficient group. Cottonseed oil or linoleate completely prevented the gross pathology. Microscopic examination of the tissues also revealed a broader spectrum of pathology in animals fed acetostearin alone than in those fed the fat-free diets. However, when acetostearin was fed with cottonseed oil or linoleate the findings were negative with the exception of a lesion observed in fat cells. When animals were fed cottonseed oil for a brief period following a period of acetostearin ingestion, all evidence of previous pathology disappeared and an immediate and dramatic increase in weight was also obtained, indicating the reversible nature of acetostearin-induced abnormalities.

In general, the ill effects resulting from the dietary ingestion of large amounts of acetostearin given as the sole source of fat are similar to the condition observed in essential fatty acid deficiency. Supplementation with a source of essential fatty acids either prevents the observed pathol-

ogy or decreases its severity. The administration of methyl oleate, biotin, fat-soluble vitamins, and bile salts to acetostearin-fed rats was without effect.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

DIAZOACETAMIDE, A REAGENT FOR THE ESTERIFICATION OF PROTEIN CARBOXYL GROUPS.

(L. C. Card No. Mic 60-854)

Marilynn Scott Doscher, Ph.D.
University of Washington, 1959

The use of diazoacetamide as a reagent for the specific modification of protein carboxyl groups has been investigated. Chymotrypsinogen A was found to be a suitable protein for this investigation.

Diazoacetamide has been synthesized in a low but reproducible yield. Attempts to increase the yield were unsuccessful. The absorption spectrum of this compound in the near ultraviolet was measured and use has been made throughout the investigation of a strong absorption maximum at 250 mμ wavelength.

The kinetics of the decomposition of diazoacetamide in aqueous solution have been studied. The rate of the decomposition has been demonstrated to be a first order function of the concentration of diazoacetamide and of the hydrogen ion concentration. The pH range over which decomposition occurs at a useful rate has been determined. The reaction of diazoacetamide with aqueous solutions of a series of carboxylic acids has been investigated. Differences in the reactivity of different types of carboxyl groups have been detected and have been found to be a function of the acidity of the carboxyl groups. These differences may also be a function of the type of charges in the vicinity of the carboxyl group. It has also been found that an undissociated carboxyl group is up to five times as reactive as the same group when it is dissociated. The relative reactivities of water and carboxyl groups toward diazoacetamide have led to the conclusion that it would be impossible to achieve quantitative esterification in a completely aqueous medium.

Modification of chymotrypsinogen A with diazoacetamide under mild conditions of pH and temperature has been achieved and a method of analyzing for the number of glycolamide residues which have been introduced into the molecule has been developed. The maximum average number of residues which could be introduced was 5.6 moles per mole of protein. Such a preparation, as well as less highly modified ones, was a mixture of several components. Chemical characterization of a mixture of proteins having an average modification of 3.5 moles of glycolamide indicated that modification had been confined to the esterification of carboxyl groups. The sedimentation pattern of this same preparation failed to reveal any detectable change in the hydrodynamic volume of the protein.

Five of the components present in a mixture having an average modification of 3.4 moles of glycolamide were separated by chromatography on carboxymethylcellulose. Three of these components were activated with trypsin. Their enzymatic activity was found to differ from that of activated unmodified chymotrypsinogen A.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

STUDIES ON MUSCLE PHOSPHORYLASE

(L. C. Card No. Mic 59-3329)

Alan B. Kent, Ph.D.

University of Washington, 1959

Abstract not available.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

SOME ENZYMATIC ASPECTS OF NITROGEN METABOLISM IN REGENERATING LIVER

(L. C. Card No. Mic 60-1006)

Sangduk Kim, Ph.D.

The University of Wisconsin, 1960

Supervisor: Professor Philip P. Cohen

This study deals with the levels of carbamyl phosphate-aspartate transcarbamylase and urea cycle enzymes in regenerating and embryonic liver. The level of the carbamyl phosphate-aspartate transcarbamylase, which is concerned with the initial step in the *de novo* synthesis of pyrimidines, was shown to be correlated with cell division or deoxypentose nucleic acid content in actively growing tissues. Taking the level of this enzyme as an index of growth rate, evidence for the existence of a growth promoting factor(s) is presented. Some preliminary studies on the characterization of the factor(s) were carried out.

A standard assay method for carbamyl phosphate-aspartate transcarbamylase was established. The complete system contained carbamyl phosphate, aspartate, diethanolamine buffer pH 9.2, and a soluble enzyme of liver prepared by high speed centrifugation (105,000 x g). Incubation was carried out at 38°. Carbamyl aspartate produced was measured by a modification of the colorimetric method of Koritz and Cohen. Regenerating liver and embryonic liver of rat were chosen as tissues representative of active growth. For the study of the growth factor(s), parabiotic rats were prepared and one of the parabions was subjected to partial hepatectomy. After a given interval the livers of the hepatectomized and non-hepatectomized animals were assayed for carbamyl phosphate-aspartate transcarbamylase levels.

The results indicated that, during the regeneration of rat liver, carbamyl phosphate-aspartate transcarbamylase is increased two-fold 48 hours following the operation. A concomitant increase of the enzyme activity of the same order of magnitude was also demonstrated in the non-hepatectomized rat of the parabiotic partner. A fraction of normal rat serum, which is heat stable and not adversely affected by dialysis, when injected intracardially, induced about a 20% increase in carbamyl phosphate-aspartate transcarbamylase activity in normal rat liver.

Activity of carbamyl phosphate-aspartate transcarbamylase of embryonic liver is 5.7 times that of the adult rat and gradually decreases as the fetus grows. On the other hand, no difference in the levels of this enzyme was observed among tadpoles and bullfrogs, although it is known that levels of activity of the urea cycle enzymes increase during metamorphosis.

It was observed that during regeneration of rat liver

there was an inverse relationship between the enzymatic level of ornithine transcarbamylase and carbamyl phosphate-aspartate transcarbamylase.

The general conclusion from this study is that a growth promoting factor(s) is present *in vivo* as a humoral agent. The factor(s) is stimulatory to cell division and may be organ specific. The possibility of its being nucleic acid or a component thereof is suggested by its stability toward heat and its properties on dialysis.

Microfilm \$2.50; Xerox \$5.80. 119 pages.

THE EFFECT OF 2-AMINO-2-METHYL-1-PROPANOL ON RATS AND ON *NEUROSPORA CRASSA*.

(L. C. Card No. Mic 60-900)

Charlotte Outland Lee, Ph.D.

University of Kansas, 1959

Statement of Problem

The purpose of this investigation was to determine the site of action of 2-amino-2-methyl-1-propanol (2A2M1P) in rats and in *Neurospora crassa*, strains #34486 and 47904.

Procedure

In order to determine whether or not symptoms of choline deficiency could be produced in adult rats, 2A2M1P was incorporated into the low choline diet of Mulford and Griffith (J. Nutrition, 23, 91 (1942)). The diet was fed *ad libitum* for from six to twelve days to male Sprague-Dawley rats three to twenty weeks of age. At the end of the experimental period the animals were sacrificed by decapitation and examined for renal and ocular hemorrhages.

Weanling male rats, weighing from 40 to 50 grams were fed either of two low choline diets, diet A (18 per cent casein, 48.7 per cent cane sugar) and diet B (42 per cent casein and 24.7 per cent cane sugar). These basal diets were supplemented with 2A2M1P and ethanolamine (EA) or one of its N-methyl derivatives. The supplements were either offered *ad libitum* in the diets or given by one daily intraperitoneal injection in 0.5 ml. of isotonic saline. Food intake and body weights were recorded daily. On the sixth day the animals were sacrificed by decapitation and the kidneys and eyes examined for hemorrhages.

The effect of 2A2M1P on liver fat was studied in weanling male rats receiving the low choline diet with and without choline chloride. The diets were offered for either five or seven days. At the end of this time the animals were sacrificed by decapitation, the livers quickly removed, weighed and frozen until time for analysis. These livers were extracted in chloroform on a Soxhlet extraction apparatus. Liver fat was taken as the total chloroform soluble material.

Neurospora crassa #47904 was grown in minimal medium containing choline chloride in the presence and absence of 2A2M1P for from six to ten days. At the end of the growth period the mycelia were harvested, homogenized and extracted with boiling water. The extracts were chromatographed on paper in two solvents. Portions of the extracts were assayed for total methylated amino alcohols on *Neurospora crassa* #34486.

The effect of 2A2M1P and of EA on growth of *Neurospora crassa* #34486 was studied when the organism was grown in the presence of either monomethylethanolamine (MMEA), β -dimethylethanolamine (DMEA) or choline for five or seven days. Upon the termination of the experimental period the mycelia were harvested, dried and weighed to constant weight.

Results

Renal lesions were consistently produced in the adult rats by either 10 or 20 mg. of 2A2M1P per gram of food. This effect was reversed when choline chloride was added to the diets containing 2A2M1P.

Animals receiving 2A2M1P in diet A or B and either MMEA, DMEA or choline did not develop renal lesions. Such was not the case when EA was present in the diet along with 2A2M1P.

Low concentrations of 2A2M1P caused an accumulation of fat in the livers and a low incidence of renal degeneration in weanling rats. Feeding high levels of 2A2M1P had the reverse effect. Choline chloride reduced the level of fat found in the livers of these animals.

In *Neurospora crassa* #47904, 2A2M1P prevented the accumulation of MMEA in the mycelia. 2A2M1P also prevented the utilization of MMEA for growth of strain #34486. Increasing the concentration of MMEA restored growth. Similar results as those obtained with 2A2M1P were observed when EA replaced 2A2M1P. The action of these two compounds in the presence of DMEA and choline was less pronounced in *Neurospora crassa* #34486.

Conclusions

In the light of the available evidence, it appears that 2A2M1P inhibits the methylation of EA both in the rat and in *Neurospora crassa* #47904. The action of 2A2M1P and EA on the utilization of MMEA in *Neurospora crassa* #34486 might be explained on the basis of a competition of these two compounds with MMEA for methyl groups or one-carbon fragments.

Microfilm \$2.50; Xerox \$6.40. 135 pages.

THE EFFECT OF SODIUM SELENITE ON CATTLE

(L. C. Card No. Mic 60-1041)

Dale Delbert Maag, Ph.D.
University of Colorado, 1959

Supervisor: Professor John R. Clopton

The purpose of this study was to determine the effect of an inorganic selenium compound on cattle under typical feedlot conditions.

Thirteen yearling Hereford steers of uniform size and in good physical condition were divided at random into two lots. One lot, containing eight steers, was fed a normal feedlot ration plus amounts of selenium (as sodium selenite) based on body weight. The other lot, containing five steers, was fed a normal feedlot ration.

The sodium selenite was administered orally with a balling gun three times each week. The initial dosage fed was 0.25 milligram per pound body weight. Blood and

urine samples were collected from each experimental animal at weekly intervals and analyzed for possible selenium content.

Two steers of the selenium-fed lot died within eight weeks. Examination showed liver and kidney damage which apparently was present before the experiment was initiated.

The other six steers of the selenium lot continued to gain in weight and demonstrated no toxic symptoms of poisoning as long as the dosage of selenium was kept below 0.50 milligram per pound body weight.

From the eighteenth to the twenty-second week of the experiment the dosage fed was increased to 0.50 milligram per pound body weight. This concentration exceeded the threshold of tolerance of the steers and caused the selenium content in the blood and urine to increase rapidly. The steers demonstrated severe ruminitis and had no desire for food. As a result of the higher dosage four steers died. The two remaining steers recovered after the dosage of selenium was decreased to 0.25 milligram per pound body weight.

The pathology at necropsy of the steers which died exhibited some involvement of the central nervous system, but injury was most pronounced in the liver, kidneys, and gastro-intestinal tract. The selenium content was greatest in the hair, liver, kidneys, spleen, and brain in the order named. After twenty-eight weeks the selenium-fed steers showed no hoof deformities, the coats did not become roughened, and there was no loss of long hair.

There is a selenium dosage level which cattle can tolerate without affecting normal growth.

Chemical analyses of animal tissues indicated that selenium was not the cause of forage poisoning.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

INVESTIGATING β -LACTOGLOBULIN AND K-CASEIN SOLUTIONS AND THEIR INTERACTIONS BY MEANS OF FLUORESCENCE POLARIZATION

(L. C. Card No. Mic 60-1204)

Charles Vernon Morr, Ph.D.
The Ohio State University, 1959

The polarization of fluorescence method has been used to study the properties of selected milk proteins and their interactions with one another in pH 6.5 phosphate buffers. The systems investigated were (1) β -lactoglobulin, (2) K-casein prepared by an urea fractionation and by a constant pH method, and (3) mixtures of β -lactoglobulin and K-casein which were either unheated or heated at 65°C. for one hour.

Fluorescent dye conjugates of these pure proteins were prepared with the dye 1-dimethylaminonaphthalene-5-sulfonyl chloride. The properties of the proteins were not markedly altered by the conjugation treatment.

The apparent molecular volume (V_o) calculated from the slope of reciprocal polarization vs T/η for pure β -lactoglobulin gave a value of 64,580 cc./mole in 0.02 ionic strength and 98,310 cc./mole in 0.10 ionic strength phosphate buffer. No change in the apparent molecular volume of β -lactoglobulin was caused by varying its concentration from 0.008 to 0.34 gm/100 ml. Addition of sucrose to

phosphate buffer solutions of β -lactoglobulin (40 per cent by weight) caused a reduction in the apparent molecular volume of the protein from 78,490 cc./mole to 48,580 cc./mole and an increase in the relaxation time from 8.56×10^{-8} seconds to 27.24×10^{-8} seconds.

Results for electrophoretic and sedimentation studies revealed only slight differences in the properties of K-casein prepared by the two methods: (a) urea fractionation and (b) constant pH method.

Polarization of fluorescence studies with urea fractionated and constant pH K-casein revealed negative slopes for the graph of reciprocal polarization vs T/η which was caused by a temperature dependent association reaction between K-casein monomers and polymers. This made calculations of the molecular volume and relaxation time for the K-casein micelle impossible. Significant variations in the intercept values and the magnitude of the negative slope for these graphs were observed upon varying the concentration of either K-casein preparation. These effects were more pronounced with urea fractionated K-casein.

Addition of sucrose to solutions of constant pH K-casein caused profound changes in its properties, resulting in larger negative slopes for the graph of reciprocal polarization vs T/η . Treatment of K-casein with Dowex 50 resin did not alter its properties. Increasing the concentration of phosphate and/or addition of ethylene diamine tetra-acetate caused a reduction in the steepness of the slopes of the above-mentioned graphs. Addition of 0.001 M to 0.01 M CaCl_2 caused slightly steeper negative slopes for these graphs. These results revealed the relative influence of the treatments upon the micelle forming properties of the K-casein system.

Examination of constant pH K-casein at pH values in the range of 3.2 to 8.4 yielded graphs with the typical negative slopes. Trials at pH 10.9 and 11.3 resulted in graphs with positive slopes. Calculations revealed values for the apparent molecular volume (V_0) of 611,900 cc./mole at pH 10.9 and 104,400 cc./mole at pH 11.3.

Increasing the ratio of β/K in solutions of conjugated β -lactoglobulin and non-conjugated K-casein, which were heated, yielded graphs for reciprocal polarization vs T/η with decreasing positive slopes and a common intercept. The common intercept at $T/\eta = 0$ for all solutions indicates that the dye molecule is exposed to the aqueous phase of the solution whether attached to a free or complexed β -lactoglobulin molecule.

Solutions of conjugated K-casein and non-conjugated β -lactoglobulin, which were heated, yielded graphs with negative slopes which became less negative with an increasing ratio of β/K . The negative slopes indicate that the dye-conjugate portion of the K-casein monomer is removed from the aqueous environment on the formation of complexes with β -lactoglobulin.

These results lead to the conclusion that heat induced complexes between β -lactoglobulin and K-casein contain a central core of K-casein and an outer layer of β -lactoglobulin. This structure stabilizes K-casein aggregates against further increases in size when additional high temperature conditions are applied.

Microfilm \$2.50; Xerox \$8.40. 183 pages.

THE ENZYMATIC PROPERTIES OF POLY-DL-t-LUECYL- α -CHYMOTRYPSIN

(L. C. Card No. Mic 60-1156)

Remedios G. Ona, Ph.D.
Columbia University, 1959

Poly-DL-t-leucyl- α -chymotrypsin was prepared by reacting crystalline α -chymotrypsin with N-carboxy-DL-t-leucine anhydride in aqueous phosphate buffer at pH 7.6. Independent structural studies indicate that only α - and ϵ -amino groups are acylated in the reaction, and that one of the polypeptide chains is attached to the ϵ -amino group of a lysine residue located near the active center of the enzyme.

A study of the enzymatic activity of this modified enzyme was carried out utilizing the following series of synthetic substrates: N-acetyl-L-tyrosinhydrazide (ATH), N-acetyl-L-tyrosinhydroxamide (ATHx), N-acetyl-L-tyrosine ethyl ester (ATEE), L-tyrosine ethyl ester (TEE) and benzoyl-L-valine methyl ester (BVME).

The experimental results showed a shift of the pH optimum by about 0.5 pH unit towards the basic side for the ATH-poly-DL-t-leucyl- α -chymotrypsin system as compared to that of the native enzyme. This shift was accompanied by an increased proteolytic activity. However, in the case of ATEE-, TEE- and ATHx-poly-DL-t-leucyl- α -chymotrypsin, there was no change in the pH optimum and a decrease in enzymatic activity was noted. Determination of the apparent kinetic constants revealed no significant change in the K_s values for all the enzymatic systems studied. On the other hand, the k_3 values for ATH-, ATHx-, ATEE-, and TEE-poly-DL-t-leucyl- α -chymotrypsin systems were 150%, 85%, 75% and 65% that of the corresponding k_3 values using α -chymotrypsin. Preliminary studies using BVME as substrate showed a 10% increase in enzymatic activity of the modified enzyme.

It appears therefore, from the results of these kinetic experiments that in those cases where the over-all rate of hydrolysis is relatively slow ($k_3 = 2.45 - 4.1 \text{ min.}^{-1}$), an increased activity is observed in the case of the modified enzyme over the native enzyme. For relatively fast reactions, however, ($k_3 = 99.3 - 11,300 \text{ min.}^{-1}$) an inhibition is observed.

These changes in the enzymatic behavior of α -chymotrypsin brought about by chemical modification may be attributed to the influence of the non-polar polypeptide chain added to the ϵ -amino group of that lysine residue situated at or near the active center of the enzyme. It is concluded that this alteration of the structure of the enzyme brings about an increase in the steps preceding deacylation of an acyl enzyme intermediate. For the systems where hydrolysis is relatively fast, the additional effect of a decrease in the rate of deacylation can be observed.

Microfilm \$2.50; Xerox \$3.00. 60 pages.

THE BIOLOGICAL PROPERTIES OF SOME SYNTHETIC POLYPEPTIDES

(L. C. Card No. Mic 60-1016)

Thomas Richardson, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Mark A. Stahmann

The thesis is divided into 6 parts:

PART 1. The Action of Polylysine on Some Ascites Tumors in Mice (reprint). Antiviral properties of polylysine prompted studies of effects of synthetic polypeptides on various tumors in mice. Polylysine preparations increased survival of mice bearing Ehrlich and TA3 ascites tumors. All untreated mice developed ascites tumors and died within 2 to 3 weeks; 25 to 90% of treated mice survived 5 weeks. Subsequently, many mice with no ascites tumors developed solid tumors; 27% survived 100 days free of tumors. Polylysine had no effect on Sarcoma 180, Adenocarcinoma 755, or Leukemia 1210. Polyglutamic acid, copolymers of leucine-lysine, glutamic-lysine, valine-lysine, and protamine sulfate did not inhibit Ehrlich ascites tumor. Cytological study of tumor cells from mice given polylysine showed mitotic index decreased and suggested inhibition at prophase. Cytochemical staining and analysis for nucleic acids and proteins showed no change on treatment, and individual cell volumes were not altered.

PART 2. Effect of Polyhomoarginine and Polylysine on the Growth of *Escherichia coli*. A polypeptide containing homoarginine was prepared by guanidization of polylysine and compared for antibacterial activity against *E. coli* H-52. Polyhomoarginine was twice as effective as polylysine with 2.5 to 5 $\mu\text{g/ml}$ and 5 to 10 $\mu\text{g/ml}$, respectively, giving complete suppression of growth for 20 hours. Arginine (5 $\mu\text{g/ml}$) did not modify polyhomoarginine action, nor did homoarginine (25 $\mu\text{g/ml}$) inhibit bacterial growth. Greater growth inhibition of polyhomoarginine was attributed to higher basicity. Trypsin hydrolyzed polylysine yielding di-, tri-, and tetralysine, but did not attack polyhomoarginine.

PART 3. Effect of Synthetic Lysine Polypeptides on Isolated Guinea Pig Ileum. Effects of polylysine, protamine, and polylysyl histamine were assayed on isolated guinea pig ileum using a Schultz-Dale technique. Polylysine (1:2,000) stimulated contraction which was blocked by Benadryl. Ileum was refractory to second challenge by polylysine. Apparently, polylysine released histamine which stimulated contraction. Polylysyl histamine was prepared by initiation of polymerization of ϵ -carbobenzoxy-N-carboxy-L-lysine anhydride with histamine and contained one histamine for every 14 lysine residues. Polylysyl histamine caused repeated ileum contractions which were blocked with Benadryl. The lysyl-histamine bond appeared highly resistant to trypsin. Relationship of these data to the proteolytic theory of histamine release were discussed.

PART 4. Effect of Supplementing Diet of Rats and Chicks with Polylysine. Various levels of polylysine were fed to rats on diets containing different levels of thiamine and to chicks on a complete diet to test for thiamine-sparing properties and antibiotic-like growth effects. Polylysine (33 to 150 ppm) in the diet had no effect on the growth of rats indicating no thiamine-sparing activity. Chicks on

complete diets containing 10 to 500 ppm polylysine did not exhibit a greater growth rate than chicks on basal ration indicating no antibiotic-like growth effects.

PART 5. Preparation of a Fluorescent Polysine. Fluorescent polylysine was prepared by acylating in methanol a fraction of the epsilon amino groups of polylysine with 1-dimethylamino naphthalene 5-sulfonyl chloride. One dye molecule was attached for every 57 lysine residues.

PART 6. Preparation of Polypeptides Containing Cysteine. S-Carbobenzoxy-L-cysteine, S-carbobenzoxy-N-carboxy-L-cysteine anhydride, and polycysteic acid were prepared as described by Berger et al. Poly-L-cysteine was obtained by removal of the S-carbobenzoxy groups with hydrobromic acid in benzene. Copolymers of γ -benzyl-L-glutamate and S-carbobenzoxy-L-cysteine were prepared by copolymerizing the corresponding N-carboxy anhydrides in benzene. Polycysteic acid (0.4 mg/ml) increased coagulation time of rat blood about 66 per cent. Microfilm \$2.80; Xerox \$9.70. 213 pages.

EFFECT OF PROTEIN:ENERGY RELATIONSHIP AND OF ZINC IN POULTRY NUTRITION

(L. C. Card No. Mic 60-1511)

Donald Earle Turk, Ph.D.
The University of Wisconsin, 1960

Supervisors: Professors M. L. Sunde and W. G. Hoekstra

Studies were conducted to determine the optimum productive energy content and percentage of dietary protein in practical diets for broilers, replacement pullets, hens, and turkey poults.

Feather and Blood meals at levels of 3 and 5% were found to be satisfactory sources of protein in high energy, high protein practical broiler diets. In diets containing these meals, increasing total protein levels up to but not above 24% improved growth and feed efficiency. Increasing the energy level by adding fat improved feed efficiency at protein levels above 24%, but did not improve growth. The ratio of Calories to percentage protein required for maximum growth increased with increases in energy level.

Increasing the energy level of diets designed for growing replacement pullets and containing 15-20% protein improved growth below 800 Calories had no effect at 900-1000 Calories, and was detrimental above 1100 Calories. At all energy levels, increasing energy improved feed efficiency. Feeding diets which had above 1000 Calories/lb. produced feather picking which could be only partially relieved by increasing the dietary protein level. However, the addition of lysine to these diets had no effect and feather meal aggravated the feather picking. Feeding high energy levels with inadequate protein delayed sexual maturity. The best performance of growing pullets resulted from feeding 20-21% protein with 900 Calories/lb. for 0-8 weeks; 15-16% protein and 800-1000 Calories for 8-15 weeks; and 13-15% protein and 800-1000 Calories for 15-20 weeks.

For laying hens in floor pens, 10-13% protein was inadequate for maximum egg production if the diet contained 1000 Calories or more. Protein levels of 14% at 1000 Calories and 16% at 1200 Calories were adequate for egg production, but feather picking occurred at these high energy levels. Addition of lysine and methionine to all-vegetable 11.3% protein diets improved egg production. Ten per cent protein was adequate for maximum egg pro-

duction, but 12% was required to maintenance of body weight in caged layers. Increased energy levels decreased the amount of feed to produce a dozen eggs.

Turkeys from 0-6 weeks old required at least 32% protein at 850-1150 Calories for maximum feed efficiency. Growth, but not feed efficiency, was further improved by 36% protein. Calorie:% protein ratios near 30 resulted in the best growth. Ladino range was superior to alfalfa range for economical gains when turkeys were forced to eat range by restricting them to a 12% protein diet. Addition of free choice grain or 5% tallow didn't improve weight gains.

In another study, hens kept in a plastic coated battery and fed purified diets showed no zinc deficiency symptoms. However, those fed soybean protein based diets (9-10 ppm zinc) produced eggs showing somewhat lowered hatchability after 13 weeks on experiment. Feeding high dietary calcium levels in this diet resulted in a hatchability near zero. Some embryos that failed to hatch lacked body walls and skeletal structures posterior to the neck, but had intact viscera. Chicks which hatched were weak, poorly feathered, would not eat or drink, had rapid and labored breathing, and died within 3-4 days. Eggs from hens fed soybean protein diets with 60-70 ppm zinc or casein diets containing 15 ppm zinc hatched and produced normal chicks. Injection, at daily intervals, of five doses of 0.7 mg. zinc alleviated deficiency symptoms in zinc deficient chicks.

Low zinc concentrations in the yolks were not correlated with the production of zinc deficient chicks, however, zinc supplementation slightly increased yolk zinc content. Blood and tissue zinc concentrations in hens were not related to dietary zinc content or to production of deficient chicks. Hens fed low zinc diets showed increased hemoglobin levels. Microfilm \$2.50; Xerox \$6.60. 137 pages.

HEMOPROTEIN 550m μ AND CYTOCHROME c OF WHEAT GERM

(L. C. Card No. Mic 60-1026)

Aaron Reuben Wasserman, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Robert H. Burris

Cytochrome c, "Wheat Germ Hemoprotein 550 m μ " (WGHP550), and several other hemoproteins were recovered from 0.5 to 40 kg. quantities of wheat germ at 5°C to 10°C by the following method: The germ was extracted by stirring with water/n-butanol (4/1, v/v) containing 0.01 M ascorbic acid and 0.00066 M disodium ethylene diamine tetraacetic acid. The filtered solution was adjusted to pH 8.8 and stirred with carboxymethyl cellulose cation exchange resin. One M NaCl, pH 7, eluted cytochrome c, WGHP550, and other hemoproteins from the recovered resin; 67% saturation ammonium sulfate precipitated all the hemoproteins except cytochrome c. Four mg. cytochrome c/kg. wheat germ with an extinction ratio, R₂₇₈m μ /550m μ (reduced) of 4/1 was recovered and further purified to a minimal ratio of 1.0 by gradient elution on an IRC50 cation exchange column. The purified cytochrome was not autoxidizable and did not react with CO; but in contrast to mammalian cytochrome c it moved more rapidly on IRC50 columns and was irreversibly denatured in salt solutions more dilute than 0.05 N.

WGHP550, the most abundant hemoprotein recovered,

was purified by gradient elution on an IRC50 column. The purified component showed no inhomogeneity in sedimentation velocity measurements at pH 7 and less than 3% impurity in moving-boundary electrophoretic measurements at pH 7.6 or 8.45. WGHP550 was crystallized with 37% saturation ammonium sulfate. Its extraction at all pH's between 6.5 and 8.8, and its crystallization argue against its being an extraction artifact. Our analysis of Estabrook's unpublished spectrophotometric data from wheat germ mitochondria indicated that they exhibited the absolute spectrum, difference spectrum and CO difference spectrum of WGHP550. No attempt has been made to extract WGHP550 from such mitochondria.

The absolute spectrum of purified reduced WGHP550 showed a maximum at 433 m μ and a broad band with a 550 m μ maximum; there was no beta band. The difference spectrum (reduced minus oxidized) had maxima near 432 m μ and 563 m μ . Oxidized WGHP550 complexed with cyanide at pH 7.6 and with ammonia near pH 9; only the latter complex could be reduced with Na₂S₂O₄. Reduced WGHP550 was autoxidizable. The reduced component formed a complex with CO which was dissociated by light and oxygen. Neither the spectrum of oxidized nor of reduced WGHP550 was affected by fluoride or azide ions at pH 7.6

The heme group of WGHP550 formed a reduced pyridine hemochromogen indistinguishable from that derived from protoheme, and, like protoheme containing enzymes, at least 80% of the WGHP550 heme could be extracted with acidic acetone. Spectrophotometric assays revealed no flavin. WGHP550's isoelectric point of pH 11 \pm 0.5 and its behavior on cation exchange columns indicate that the hemoprotein is highly basic.

The sedimentation coefficient of WGHP550, S_{20,w}, was 3.16(\pm 0.09)S; the partial specific volume was 0.720(\pm 0.003) ml./g. By the Ehrenberg method of approach to sedimentation equilibrium, the molecular weight was 38,900 g./mole(\pm 6%). The equivalent weight per mole of heme was 34,500 to 38,900 depending on whether the coefficient of the reduced pyridine hemochromogen of protoheme at 556 m μ was taken as E = 31 or 35 cm²/μmole respectively. The agreement of the molecular and equivalent weights indicated that WGHP550 contains one heme per molecule.

Impure WGHP550 oxidized impure wheat germ ferrocytochrome c. Cyanide prevented this oxidation and produced the spectrum of the oxidized WGHP550-CN⁻ complex. Although enzymic studies have not been performed with purified WGHP550, its autoxidizability, sensitivity to cyanide and light-reversible combination with CO suggest the hypothesis that WGHP550 may be a cytochrome c peroxidase or oxidase in wheat germ.

Microfilm \$2.50; Xerox \$6.20. 130 pages.

CHEMISTRY, INORGANIC

SOME SUBSTITUTION REACTIONS OF COBALT(III) COMPLEXES OF ETHYLENEDIAMINETETRAACETIC ACID

(L. C. Card No. Mic 60-1174)

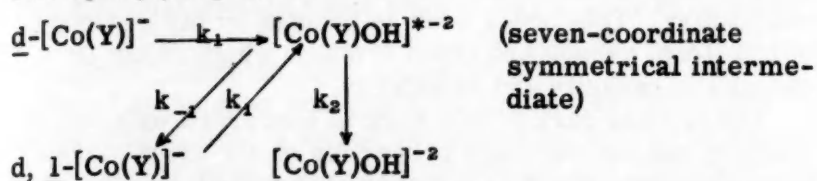
Dean William Cooke, Ph.D.
The Ohio State University, 1959

Base hydrolysis reactions of the hexadentate ([Co(Y)]⁻) and hydroxopentadentate ([Co(Y)OH]⁻²) complexes of cobalt(III) with ethylenediaminetetraacetic acid were studied and shown to have a first-order dependence on

hydroxide ion. These compounds have no ionizable proton required to explain the mechanism in terms of Garrick's S_N1CB mechanism. Values of the activation energy E_a and pre-exponential term A for base hydrolysis of $[Co(Y)]^-$ and $[Co(Y)OH]^{-2}$ and base catalyzed racemization of $d-[Co(Y)]^-$ were, respectively, E_a , 25.6, 34.2, 32.7 kcal/mole-deg.; A , 1.6×10^{10} , 4.8×10^{23} , 5.1×10^{24} liters/mole-min. Between 35° and 53°C base catalyzed racemization of $d-[Co(Y)]^-$ is fastest and base hydrolysis of $[Co(Y)OH]^{-2}$ slowest.

Attack by hydroxide ion on one of the two front faces of the $d-[Co(Y)]^-$ or $d, l-[Co(Y)]^-$ octahedron to form a symmetrical seven-coordinate intermediate (a symmetrical triangular prism with the hydroxide ion in the face opposite the ethylenediamine) is the suggested mechanism.

The intermediate dissociates either the hydroxide ion to reform a d, l mixture of $[Co(Y)]^-$ or a carboxyl group to form $[Co(Y)OH]^{-2}$.



The base catalyzed racemization constant is equivalent to k_1 , and the hydrolysis constant is $k_1 k_2 / (k_{-1} + k_2)$ assuming steady state conditions. The ratio k_{-1}/k_2 must be greater than one for base catalyzed racemization to be greater than base hydrolysis. This ratio varied from 2 to 5 between 35° and 53°C. $E_{-1} - E_2$ is 8.8 kcal/mole and A_{-1}/A_2 is 6×10^6 . The base hydrolysis of $[Co(Y)OH]^{-2}$ proceeds to uncharacterized products but involves attack of the first hydroxide ion as the rate-determining step. A mechanism similar to base hydrolysis of $[Co(Y)]^-$ is assumed.

Substitution reactions of ethylenediamine on $[Co(Y)]^-$ and $[Co(Y)OH]^{-2}$ were studied and initial rate constants determined. The reactions depended on both ethylenediamine (en) and the singly charged ethylenediammonium ion (enH^+). Reactions with $[Co(Y)]^-$ proceed to the tris-ethylenediaminecobalt(III) ion, while those with $[Co(Y)OH]^{-2}$ form some uncharacterized product. Attack of the neutral end of the en or enH^+ to form a seven-coordinate intermediate with two long bonds to the en (or enH^+) and one of the carboxyl groups is the suggested mechanism.

X-ray structural determinations by Hoard suggest that the point of attack is adjacent to either cobalt-oxygen bond opposite the ethylenediamine portion of the hexadentate ligand. Further attack by the other end of the ethylenediamine replaces one of the three remaining oxygen atoms, and complete replacement of the ligand gives, assuming only statistical effects, 67% of one optical isomer and 33% of the other. Attack on $[Co(Y)OH]^{-2}$ with its hydroxide ion in one of these two planar positions leads to racemic products as the Co-OH bond is considered stronger than the remaining Co-O bonds. Attack by en on other pentadentate complexes ($[Co(Y)X]^{-2}$) results in varying percentages of retained isomer depending upon the strength of the Co-X bond and the steric effects of the group X.

Ethylenediamine solution may also contain considerable amounts of hydroxide ion resulting in base hydrolysis to form only racemic products as discussed earlier.

The above is in accord with work by Dwyer who obtained 63% of one isomer when reacting anhydrous ethylenediamine with $d-[Co(Y)]^-$ and lesser per cents with $[Co(Y)X]^{-2}$,

including only racemic product with $[Co(Y)NO_2]^{-2}$ in which NO_2^- should sterically inhibit replacement. Values obtained in 50% aqueous ethylenediamine were correspondingly lower, indicating occurrence of base hydrolysis. A value of retained isomer of 56.6% agrees with the predicted value of 57.6% calculated from the concentrations and rate constants. Absolute configurations of $[Co(Y)]^-$ and $[Co(Y)X]^{-2}$ are discussed.

Microfilm \$3.35; Xerox \$11.70. 260 pages.

THE CALORIMETRIC DETERMINATION OF HEATS OF REACTION FOR SOME COMPLEX ION FORMATION REACTIONS:

1. THE IRON(III) - CHLORIDE SYSTEM.
2. THE MERCURY(II) - HALIDE SYSTEM.
3. THE THALLIUM(III) - CHLORIDE SYSTEM.

(L. C. Card No. Mic 60-991)

Patrick Kent Gallagher, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Edward L. King

A calorimeter was constructed and the values of ΔH were determined for the following complex ion formation reactions:

- (a) $Fe^{+3} + Cl^- = FeCl^{+2}$ $I = 1.0 \text{ M and } 3.7 \text{ M}$
 (b) $Hg^{+2} + nX^- = HgX_n^{2-n}$ $I = 0.5 \text{ M with } n = 1 - 4$
 for $X^- = Cl^-$, and $n = 4$ for $X^- = Br^-$ and I^-
 (c) $Tl^{+3} + nCl^- = TlCl_n^{3-n}$ $I = 3.0 \text{ M with } n = 1 - 4$

In order to obtain the value of ΔH from the calorimetric data, the values of the equilibrium quotients must be known. Only for the reaction forming $TlCl^{+2}$, among those studied, was there no reliable value of the equilibrium quotient available. The values of ΔH have been combined with the values of the equilibrium quotients from the literature in order to evaluate ΔS . The values obtained are given in the accompanying table.

The Thermodynamic Quantities for the Reactions,
 $M^{+m} + nX^- = MX_n^{m-n}$

M^{+m}	X^-	n	I	ΔF	ΔH	ΔS
Fe^{+3}	Cl^-	1	1.0M	-0.62 ₂ ^a kcal./mole	4.2 ₃ kcal./mole	16.4 e.u.
Fe^{+3}	Cl^-	1	3.7	-1.4 ₄ ^a	3.4 ₃	16.3
Hg^{+2}	Cl^-	1	0.5	-9.2 ₆ ^b	-5.9	11.1
Hg^{+2}	Cl^-	2	0.5	-18.0 ₆ ^b	-12.8	17.4
Hg^{+2}	Cl^-	3	0.5	-19.3 ₃ ^c	-15.0	14.4
Hg^{+2}	Cl^-	4	0.5	-20.7 ₇ ^c	-14.9	19.7
Hg^{+2}	Br^-	4	0.5	-28.8 ₈ ^d	-27.7	3.0 ₂
Hg^{+2}	I^-	4	0.5	-40.7 ₇ ^c	-44.8	-13.8
Tl^{+3}	Cl^-	1	3.0	—	-5.4 ₄	—
Tl^{+3}	Cl^-	2	3.0	-17.8 ₈ ^a	-10.6	25.3
Tl^{+3}	Cl^-	3	3.0	-21.6 ₆ ^a	-11.1	36.2
Tl^{+3}	Cl^-	4	3.0	-25.6 ₆ ^a	-11.1	46.6

a. Sister M. J. M. Woods, O. P., Unpublished work, University of Wisconsin, 1959.

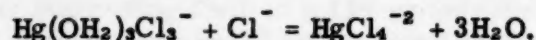
b. L. G. Sillen, Acta Chem. Scand., 3, 539 (1949).

c. Y. Marcus, Ibid, 11, 599 (1957).

d. An average of the values obtained in reference b and c.

The value of ΔS obtained for the formation of FeCl^{+2} is very similar to the value of ΔS for the analogous chromium(III) reaction.¹ This suggests that both reactions involve the replacement of one water molecule by one chloride ion, $\text{M}(\text{OH}_2)_6^{+3} + \text{Cl}^- = \text{M}(\text{OH}_2)_5\text{Cl}^{+2} + \text{H}_2\text{O}$.

The stepwise reaction in which HgCl_4^{-2} is formed has an unusually positive value of ΔS . This is explained by postulating that mercury(II) undergoes a change in coordination number from six to four in the reaction,



The liberation of the two additional water molecules would give rise to a more positive value of ΔS than would be expected on the basis of the replacement of a single bound water molecule by a chloride ion. On the basis of Raman spectra² and the x-ray diffraction of aqueous mercury(II)-chloride solutions³, it has been suggested that HgCl_4^{-2} is tetrahedral, a conclusion consistent with this suggested change in coordination number.

The Raman spectra of HgCl_4^{-2} and TlCl_4^- were measured and the work of Woodward confirmed in the case of HgCl_4^{-2} . The Raman spectra observed for TlCl_4^- suggests that it is also tetrahedral.

Microfilm \$2.50; Xerox \$7.40. 156 pages.

1. H. S. Gates and E. L. King, *J. Am. Chem. Soc.*, **80**, 5011 (1958).

2. J. A. Rolfe, D. E. Sheppard, and L. A. Woodward, *Trans. Faraday Soc.*, **50**, 1275 (1954).

3. (a) C. L. van Panthaleon van Eck, H. B. Walters, and W. J. M. Jaspers, *Rec. trav. chim.*, **75**, 802 (1956); (b) C. L. van Panthaleon van Eck, Thesis, Leiden (1958).

THE COBALT-60 GAMMA IRRADIATION OF AQUEOUS NITRATE SOLUTIONS

(L. C. Card No. Mic 60-931)

Kenneth Kustin, Ph.D.
University of Minnesota, 1959

The cobalt-60 gamma irradiation of aqueous nitrate solutions results in the decomposition of the nitrate ion. To study this reaction, nitrate ion was irradiated in the presence of ceric ion. The mechanism for the radiation induced reduction of ceric ion is well understood. One of the reactions involves the reoxidation of cerous ion by hydroxyl radical. A competition for hydroxyl radical between nitrate and cerous ions has been proposed. The effect of nitrate ion on $\text{G}(\text{Ce III})$, $\text{G}(\text{H}_2)$, and $\text{G}(\text{O}_2)$ has been measured. The ratio of rate constants for the hydroxyl competition has been determined to be 390. The effect of thallous ion on the nitrate irradiation has been investigated. The results indicated that the increased ceric reduction was due to additional reactions between nitrate and thallium. Preliminary experiments indicated that a reaction between nitrate and thallium(III) might have occurred.

Microfilm \$2.50; Xerox \$3.00. 60 pages.

THE INVESTIGATION OF NON-SILICIC ION EXCHANGERS

(L. C. Card No. Mic 60-1023)

Donald Richard Vissers, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Edwin M. Larsen

Most of the recent work in the field of ion exchange has dealt with organic resins with very little work being done in the field of inorganic non-silicic ion exchangers. However with the advent of nuclear energy a demand came for an ion exchange material which was stable at high temperatures and pressures and also stable in the presence of high concentrations of radioactive species, as well as over a range of pH. The organic materials are known to break down at high temperatures in solutions which are very radioactive. This break down is created by the hydrolysis of functional groups and chain scission which result in changes in capacity and selectivity.

The greater part of this work is concerned with the stability and ion exchange properties of air-dried zirconium phosphate which is a glassy amorphous substance suitable as an ion exchanger at high temperatures, pressures and in the presence of radioactive species. This material exhibits ion exchange properties similar to a cationic organic resin.

Hydrolysis studies carried out on a series of zirconium phosphates ranging in composition from $\text{ZrO}_2:\text{P}_2\text{O}_5$ ratios of 1.00:1.02 to 1.00:0.645 indicated that materials with $\text{ZrO}_2:\text{P}_2\text{O}_5$ ratios less than 1.00:0.861 were more stable toward hydrolysis than those with a higher phosphorus content. These studies also showed that the insoluble phosphate was kinetically more stable toward hydrolysis when the material was precipitated slowly from solutions with reagent concentrations of the order of 10^{-2} molar, than when precipitated rapidly from more concentrated reagents.

Ion exchange studies on the zirconium phosphates using copper (II) as the exchanging ion showed that the maximum capacity of the various preparations was a function of the phosphorus content. The maximum capacity was found to be 1.36 meq./1/2 mm. of P_2O_5 .

A zirconium phosphate with a $\text{ZrO}_2:\text{P}_2\text{O}_5$ ratio of 1.00:0.784 was used as the ion exchanger in a series of equilibrium studies. The material was found to be a unifunctional exchanger up to pH 5. The unifunctional capacity was 0.315 meq./1/2 mm. of P_2O_5 .

Ion exchange studies with lithium, sodium and potassium ions at pH one were carried out over a temperature range of $1.17^\circ - 44.5^\circ$; the salt concentrations varied from 0.1 N to 0.8 N. To evaluate the various thermodynamic quantities equilibrium quotients were calculated. Activity coefficient corrections were made in the aqueous phase. However, corrections in the solid phase were not possible because of the limited range of solid phase compositions over which equilibrium quotients could be determined. However for comparative studies a relative free energy and entropy were evaluated. The relative equilibrium constants were evaluated by extrapolating a plot of $\log K_a$ (K_a is the calculated equilibrium quotient) vs. mole fraction of metal ion in the solid phase to zero mole fraction metal ion in the solid phase. The evaluation of the relative equilibrium constants for a series of temperatures

enabled us to evaluate the ΔH° for the various systems from a plot of $\log K_r$ vs. $1/T$. These results are shown in Table 1.

Table 1

System	$-\Delta H^\circ$	ΔF_r	$-\Delta S_r$
LiCl-HCl	0.0 Kcal	2.0 Kcal	7 e.u.
NaCl-HCl	2.3 "	1.1 "	11 e.u.
KCl-HCl	5.4 "	0.5 "	20 e.u.

Other areas of work include studies on cerium (IV) phosphate which was found to be a solid oxidizer capable of cationic ion exchange similar to zirconium phosphate. The material used in these studies had a $\text{CeO}_2:\text{P}_2\text{O}_5$ ratio of 1.00:0.790. The substance is capable of oxidizing potassium iodide to free iodine at pH 7. It is also capable of exchanging and oxidizing manganese (II) at the same time making it an ion exchanger as well as an electron transfer agent. It should be pointed out that under the conditions employed the cerium (III) phosphate is also insoluble.

Sodium peroxyhafnate was prepared and investigated and found to be very similar to the sodium peroxyzirconate prepared by Dr. Peggy Hurst.¹

Microfilm \$2.50; Xerox \$8.00. 172 pages.

1. P. Hurst, Doctorate Thesis, U. of Wis. (1956).

CHEMISTRY, ORGANIC

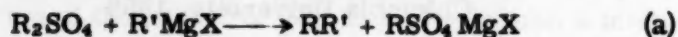
THE STEREOCHEMISTRY OF THE REACTIONS OF SOME ALKYL SULFATES WITH PHENYLLITHIUM AND *n*-BUTYLLITHIUM

(L. C. Card No. Mic 60-959)

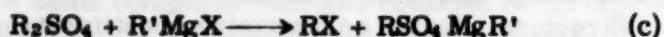
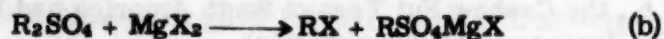
Kenneth K. Andersen, Ph.D.
University of Minnesota, 1959

Adviser: Dr. S. W. Fenton

The normal reaction of alkyl sulfates with organomagnesium halides is reported to be alkylation (1):



A side reaction involving either the magnesium halide present in the Grignard reagent solution or the organomagnesium halide is the only other reaction which has been reported (1):



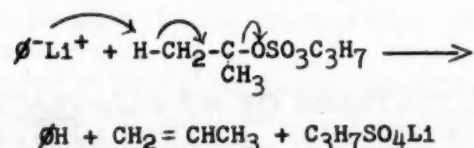
Reactions a, b, and c can be explained as an $\text{S}_\text{N}2$ type of nucleophilic attack by the organomagnesium halide or

magnesium halide upon the carbon atom attached to the sulfate radical. The path of such nucleophilic displacement reactions should be subject to steric factors.

The object of this investigation was to study the reactions of various alkyl sulfates with phenyllithium and *n*-butyllithium to see if steric factors did influence the course of the reactions. This was found to be the case. The reactions of the following alkyl sulfates with phenyllithium and *n*-butyllithium were studied: ethylene sulfate (I), *cis*-1,2-cyclohexyl sulfate (II), *trans*-1,2-cyclohexyl sulfate (III). The reactions of the following alkyl sulfates with phenyllithium only were also studied: methyl sulfate (IV), *n*-butyl sulfate (V), *i*-propyl sulfate (VI), cyclohexyl sulfate (VII), *cis*-1,2-cyclopentyl sulfate (VIII). The products obtained using *n*-butyllithium were analogous to those obtained using phenyllithium, but somewhat more difficult to isolate.

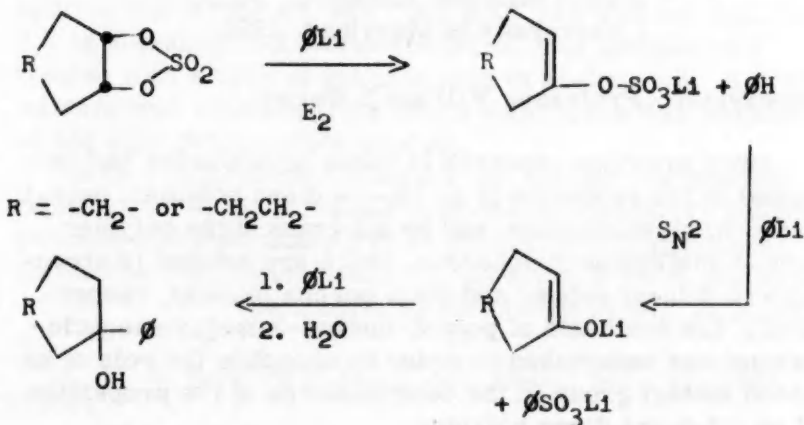
I, IV, and V gave alkylation when treated with phenyllithium. I gave a mixture of bibenzyl and complex hydrocarbons. These hydrocarbons arose from the attack of bibenzyl as a nucleophilic reagent upon I. IV and V gave toluene (61% yield) and *n*-butyl benzene (80% yield), respectively. The yields are calculated on the basis that both alkyl groups in IV and V are replaceable. Some alkyl halide was also formed in each reaction.

VI and VII also gave alkylation products. In addition, some alkene was formed in each case by an E_2 elimination reaction:



VI gave some propene. VII gave some cyclohexene.

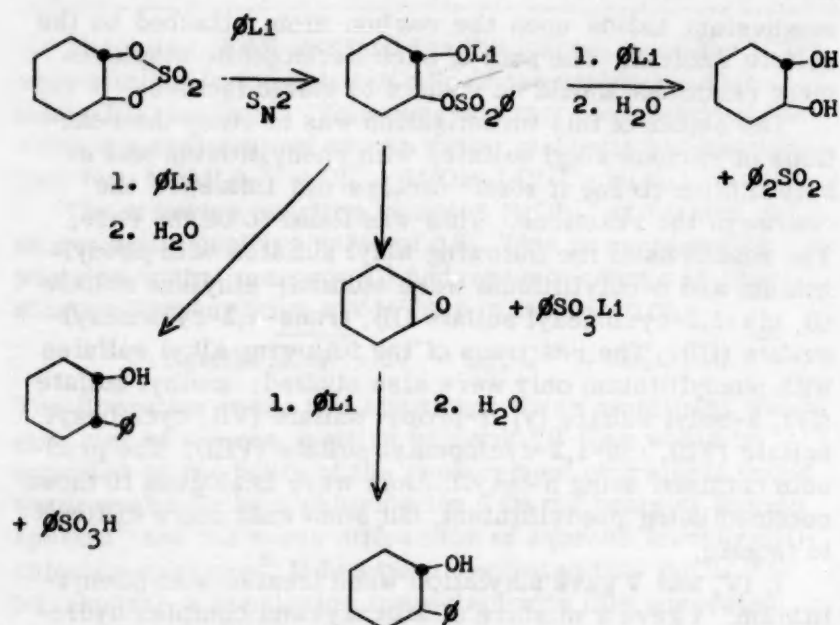
II and VIII gave 1-phenylcyclohexanol (71% yield) and 1-phenylcyclopentene (89% yield), respectively. The mechanism may be written as:



The 1-phenylcyclopentanol formed dehydrated upon distillation to 1-phenylcyclopentene.

III gave a mixture of products from which were obtained: phenyl sulfone (12% yield), *trans*-1,2-cyclohexanediol (56% yield), and a mixture of *cis*- and *trans*-2-phenylcyclohexanol (13% yield). The reaction may be written as indicated on the following page.

Thus, evidence has been presented which indicates that reactions other than the normal alkylation reactions take place when sterically hindered alkyl sulfates are treated with organolithium compounds. These reactions can be



successfully interpreted if the organolithium compound is treated as a nucleophilic reagent.

Reference

1. A. Cope, J. Am. Chem. Soc., **56**, 1578 (1934).
Microfilm \$2.50; Xerox \$6.20. 128 pages.

THE SYNTHESIS OF AN ALL-TRANS DIENE POLYMER, A STUDY OF THE WITTIG REACTION FOR THE SYNTHESIS OF EXOCYCLIC OLEFINS AND DIRECTIONAL STUDIES IN THE PYROLYSIS OF TERTIARY AND SECONDARY ACETATES.

(L. C. Card No. Mic 60-1287)

Joseph Matthew Antonucci, Ph.D.
University of Maryland, 1959

Supervisor: Professor William J. Bailey

Since previous research in these laboratories had resulted in the synthesis of an all-cis diene polymer, poly-1,2-dimethylcyclohexane, and an all-trans diene polymer, poly-3-methylenecyclohexene, which are related in structure to natural rubber and gutta percha (balata), respectively, the synthesis of poly-2-methyl-3-methylenecyclohexene was undertaken in order to elucidate the role of an added methyl group in the determination of the properties of an all-trans diene polymer.

The synthesis of the required 2-methyl-3-methylenecyclohexene by two alternate synthetic routes was considered. One method employed the Wittig reaction of 2-methyl-2-cyclohexenone with triphenylphosphinemethylene. Although the yield of diene was low (24%), the monomer was of sufficiently high purity to permit its polymerization to the desired polymer. An alternative method involved the dehydration of 1,2-dimethyl-2-cyclohexenol followed by subsequent purification of the resulting diene mixture by means of a Diels-Alder reaction with maleic anhydride. This approach to the synthesis of the monomer was less attractive since it resulted in a low yield of the desired

diene which, in addition, was shown to be of insufficient purity for polymerization studies.

The characterization of 2-methyl-3-methylenecyclohexene was accomplished by elemental, vapor phase chromatographic and infrared and ultraviolet spectral analysis. Polymerization of the monomer cationically with boron trifluoride gas gave a white crystalline solid with a softening point in the range of 123-131°. The properties of the polymer were studied in relation to those of balata and poly-3-methylenecyclohexene.

The use of the Wittig reaction in the synthesis of 2-methyl-3-methylenecyclohexene led to the second phase of this work, the study of the Wittig reaction as a means of synthesis of exocyclic olefins from a series of six-membered alicyclic ketones. This investigation had two objectives: (1) to study the stereoselectivity of the reaction by vapor phase chromatography and (2) to determine the effect of ortho substituents and α,β -unsaturation on the course of the reaction. The results obtained appeared to confirm the view that the Wittig reaction does yield exclusively one positional isomer. It was found also that substituents in the 2-position of the ring seem to favor the reaction whereas α,β -unsaturation in the ring apparently hinders the reaction. By use of the Wittig reaction the synthesis of 2,2-dimethylmethylenecyclohexane in a pure form and in a good yield was accomplished.

A third phase of this work was concerned with a study of the direction of elimination of acetic acid in the pyrolysis of some tertiary and secondary acetates. The use of vapor phase chromatography provided a highly sensitive method for the determination of the olefinic content of the pyrolysate and, therefore, of the direction of elimination.

Methylethylethynylcarbonyl and methylethylvinylcarbonyl acetates were pyrolyzed and the directional effects of the ethynyl and the vinyl groups were studied. An evaluation of the possible synthetic utility of these pyrolyses was made.

Similarly, a directional study of the pyrolysis of the secondary acetates, *sec*-butyl and methylisobutylcarbonyl acetates, was undertaken. It was found that the pyrolysis of *sec*-butyl acetate favored the formation of the Hofmann olefin slightly whereas that of methylisobutylcarbonyl acetate favored the Saytzeff olefin slightly.

Microfilm \$2.50; Xerox \$8.60. 186 pages.

THE SYNTHESIS OF THE DIOLEFINIC CONSTITUENT OF POISON IVY URUSHIOL

(L. C. Card No. Mic 60-1130)

William Joseph Becker III, Ph.D.
Columbia University, 1959

Contact with the sap of plants of the Anacardiaceae family (poison ivy and related plants), is one of the most common causes of dermatitis in this country. Members of this family of plants are found throughout the world; i.e., the Cashew Nut Tree of South America and India, and the Japanese Lac Tree of Japan.

Structural studies on the active constituents of the sap of these plants have shown them to be a mixture of alkenyl phenols; compounds of the same carbon skeleton containing varying degrees of unsaturation. However, little is

known of the physiological mode of action of these compounds. Furthermore, no satisfactory method of prophylaxis, treatment, or desensitization exists for the dermatitis caused by these plants.

Work in these laboratories has fully elucidated the structure of some of these compounds. However, the nature of these compounds is such that it is impossible to resolve the mixtures into the pure components in the unmodified, active form. In order to gain a fuller understanding of the physiological action of these substances, it seemed necessary to evaluate each of the components separately. Therefore, in order to obtain samples of the pure components, synthetic studies were undertaken.

Previous work has resulted in the synthesis of the monoolefin of poison ivy in the free catechol form. The present work involved synthetic studies directed toward the synthesis of the diolefinic component of poison ivy. This work was only partially successful. Synthesis of the dimethyl ether of the diolefin was achieved. However, the synthesis of the diolefin in the free catechol form was only of marginal success.

The crude product from the synthesis of the dimethyl ether of the diolefin was shown to be a mixture. This mixture could only be resolved chromatographically. It was reasoned that the small amount of the diolefinic component in the free catechol form that was obtained was also a mixture of similar nature. The synthetic approach to the poly-unsaturated alkenyl phenols is rendered unattractive by this fact. This synthetic scheme, while it may be of fairly general applicability, is only really useful in the preparation of monoolefinic compounds.

Microfilm \$2.50; Xerox \$3.60. 65 pages.

THE SYNTHESIS OF SOME TRIPTYCENE DERIVATIVES SUBSTITUTED AT THE BRIDGEHEAD

(L. C. Card No. Mic 60-909)

Edward Walton Berndt, Ph.D.
University of Minnesota, 1959

Information was obtained about highly substituted triptycene derivatives. It was noted that the benzoquinone adducts of anthracene and 9-substituted anthracene derivatives were heat sensitive materials and that they slowly darkened in air. In general, more steam than that required to remove solvents in the preparation of adducts and temperatures over 95° had to be avoided. The use of steam destroyed the highly reactive adduct of 9-anthraceneethyldimethylamine and, in the case of the attempted preparation of the adduct of 9-anthraceneethanol, a mixture was obtained that consisted mostly of the cyclization product, 1,2-pyrano-5-hydroxytriptycene.

Attempts to rearrange the benzoquinone adducts to the corresponding hydroquinones gave various results. The adduct of 9-anthraceneethyl chloride under the usual rearrangement conditions gave 1,2-pyrano-5-hydroxytriptycene, the same compound that was obtained in the attempted preparation of the benzoquinone adduct of 9-anthraceneethanol. Attempted rearrangement of the adduct from 9-anthraceneethyldimethylamine hydrochloride under similar conditions gave a black tarry substance

which could not be crystallized. Formation of 2,5-triptycenehydroquinone-1-propionic acid from its adduct occurred rapidly in 70-80% yields.

Preparation of the ethyl ester of 2,5-triptycenequinone-1-propionic acid was accomplished only after much difficulty by preparing the ethyl ester of 2,5-triptycenehydroquinone-1-propionic acid and oxidizing this with chromium trioxide in acetic acid-water mixture. The difficulty in the preparation of this quinone appears to be due primarily to the interference of the carboxyl group.

The unsuccessful preparation of the ethyl ester of 2,5-triptycenedioxime-1-propionic acid is probably also due to the interference of the propionate group, as only the monoxime was formed under conditions previously used to obtain the dioxime. More drastic conditions gave mixtures of variable melting point which prevented the complete synthesis of triptycene-1-propionic acid.

A substantially improved synthesis of 1-bromotriptycene was carried out by modifying Bartlett's procedure.¹ The two major changes were the preparation of 9-bromoanthracene using 1,3-dibromo-5,5-dimethylhydantoin² and preparation of the benzoquinone adduct in ethanol.

It was hoped that 1-bromotriptycene could be used to prepare triptycene-1-ethanol from the 1-lithium derivative of triptycene by treatment with ethylene oxide, but this hope was not realized. Impure triptycene was formed as the major product of the reaction. An attempt to prepare triptycene-1-chloromethyl ketone by the action of chloroacetyl chloride upon the lithium derivative of triptycene gave the same result.

The method of Wittig³ for preparing triptycene directly from anthracene was unsuccessful when applied to 9-anthraceneethyldimethylamine. A neutral oil was formed along with some impure solids that usually were partly inorganic. The oils could not be crystallized.

The failure of the preceding methods in obtaining the desired triptycene derivatives led to an attempt to synthesize triptycene by a different procedure. The benzoquinone adduct of anthracene was reduced with lithium aluminum hydride and a mixture was obtained. The desired diol, 1a, 2,5,5a-tetrahydro-2,5-triptycenediol, was isolated and treated with a drop of sulfuric acid in acetic acid. A brown mixture was obtained from which anthracene was isolated as the only recognizable product.

Since 1-triptyceneethylamine or similar derivatives could not be synthesized the 9,10-maleic anhydride adducts and benzoquinone adducts of 9-anthraceneethyldimethylamine and 9-anthraceneethyl-(1-piperidine) were prepared.

Microfilm \$2.50; Xerox \$4.00. 74 pages.

1. P. D. Bartlett et al., *J. Am. Chem. Soc.*, **72**, 1003 (1950).
2. J. F. Sallellas and O. O. Orazi, *Anales asoc. quim. Argentina*, **39**, 175-83 (1951); *Chem. Abstracts*, **47**, 2708 i (1953).
3. G. Wittig and R. Ludwig, *Angew. Chem.*, **68**, 40 (1956).

HYDROLYSIS REACTIONS OF HALOGENATED CYCLOBUTENE ETHERS: SYNTHESIS OF DIKETOCYCLOBUTENEDIOL.

(L. C. Card No. Mic 60-1062)

Sidney Cohen, Ph.D.

University of Colorado, 1959

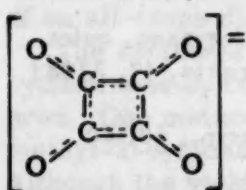
Supervisors: Professors Joseph D. Park and John R. Lacher

The aim of this thesis was to study the hydrolysis reactions of halogenated cyclobutene ethers with a view towards the ultimate synthesis of diketocyclobutenediol, a structure which should have the same degree of formal strain as cyclobutadiene. Diketocyclobutenediol would be the logical end-product of the complete hydrolysis of cyclobutenes that are fully substituted with groups other than carbon and hydrogen. There has been much interest aroused recently in the cyclobutadienoquinone structures by the works of Roberts and Bloomquist on the phenyl substituted cyclobutadienoquinones. Diketocyclobutenediol, $\text{OC}-\text{C}(\text{OH})=\text{C}(\text{OH})-\text{CO}$, can be considered as dihydroxy-cyclobutadienoquinone.

Young and Tarrant and Park et. al. have demonstrated that the fluorine atoms, alpha to an alkoxyl group in fluorinated ethers, are readily hydrolyzed to give the corresponding esters and acids. It, therefore, seemed plausible that the fluorine atoms in 1,2-diethoxy, 3,3,4,4-tetrafluorocyclobutene should similarly hydrolyze, since they are vinylogs of the α,α -difluoro-ethers. The diether was prepared after the manner of Park, Sharrah and Lacher and was hydrolyzed with 50% sulfuric acid to give the desired diketocyclobutenediol.

This compound is a stable white solid which starts to decompose at 293° . It is a strong dibasic acid with $\text{pK}_1 \sim 1$, and pK_2 of 3.0. Aqueous solutions of the acid give a very strong enol test, are cleaved by periodic acid, decolorize permanganate, cerate, and bromine water. The acid is quantitatively oxidized by cerate solution to carbon dioxide, thus demonstrating each carbon atom to be substituted with an oxygen function only. The oxidation equivalent weight was found to be 11.4 grams (1/10 molecular weight) thus agreeing with the theoretical value for complete oxidation. The neutralization equivalent was found to be 57.8 (theoretical for the dibasic acid is 57.1). The solid analyzed for $\text{C}_4\text{H}_2\text{O}_4$; the dipotassium salt crystallized with one molecule of water of hydration and analyzed for $\text{K}_2\text{C}_4\text{O}_4 \cdot \text{H}_2\text{O}$.

In the anion, $\text{C}_4\text{O}_4^{=}$, all four oxygen and carbon atoms might be expected to become equivalent through resonance so that it may be best represented as the mesomeric anion.



The infrared spectrogram of the potassium salt bears this out in that the carbonyl and $\text{C}=\text{C}$ absorptions occurring in the solid acid disappear and instead a very intense absorption around 6.6 microns appears due to the

$\text{C}-\text{O}$ breathing vibration of the structure as a whole.

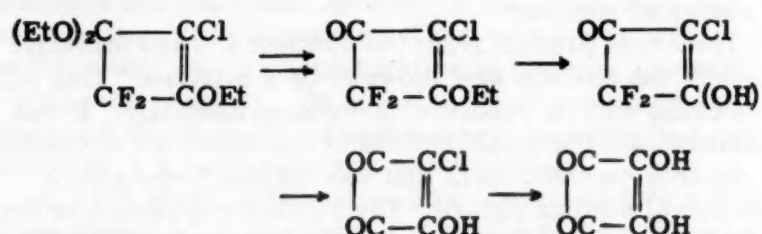
Roberts had demonstrated that allylic fluorine atoms in phenyl-substituted cyclobutenes are prone to hydrolysis with sulfuric acid to give the corresponding carbonyl group. It, therefore, seemed plausible that the triether, whose structure was postulated to be 1,3,3-triethoxy-2-chloro-4,4-difluorocyclobutene, might hydrolyze to diketocyclobutenediol.

The unsaturated triether was prepared according to the method of Park, Snow, and Lacher and was hydrolyzed with water to give the expected diketocyclobutenediol along with the product of partial hydrolysis,

$\text{CF}_2-\text{C}(\text{OH})=\text{CCl}-\text{CO}$ 3-keto-2-chloro-4,4-difluorocyclobutenol. This enol was esterified with ethanol to give 2-chloro, 3-ethoxy-4,4-difluorocyclobutenone,

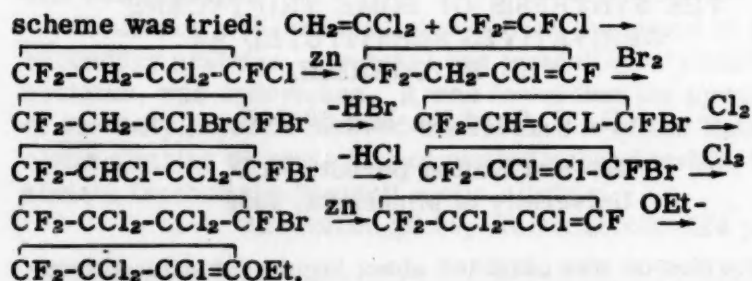
$\text{CF}_2-\text{C}(\text{OEt})=\text{CCl}-\text{CO}$ which was also prepared by the ketalysis of the triether in non-aqueous media. A small amount of a solid white tetraether, 1,1,3,3-tetraethoxy-2-chloro-4,4-difluorocyclobutane was also isolated in the hydrolysis reaction.

Another aim of the work of this thesis was to elucidate the structure of the triether which was postulated as 1,3,3-triethoxy-2-chloro-4,4-difluorocyclobutene. The products of the hydrolysis reaction are completely consistent with this structure. The hydrolysis reaction of the triether which is a vinylog of an ortho-ester may be visualized to be as follows:



Although these reactions demonstrated the assigned structure which should result only if the fluorine and chlorine have a 1,3-relation to each other, a rigorous classical proof of structure was attempted. Consequently, the unequivocal synthesis of $\text{CF}_2-\text{C}(\text{OEt})=\text{CCl}-\text{CCl}_2$, which was

prepared from $\text{CF}_2-\text{CCl}=\text{C}(\text{OEt})-\text{CO}$ and phosphorous pentachloride, was attempted. The following nine step scheme was tried:



Many attempts were made to hydrolyze the chlorine

adduct of the triether, $\text{CF}_2-\text{C}(\text{OEt})_2-\text{CCl}_2-\text{CClOEt}$, but the saturated cyclobutane structure was found quite stable even to 50% sulfuric acid. Previous work in this laboratory has demonstrated the stability of saturated cyclobutane ethers.

Diketocyclobutenediol forms interesting colored precipitates with metal ions and its chelation potentialities and inorganic chemistry will be studied by Dr. Harold F. Walton of the University of Colorado. The biochemical properties and potentialities will be examined by Dr. John R. Clopton. The crystal structure of the potassium salt is currently being investigated by Dr. Walter M. MacIntyre also of this University.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

ELECTROPHILIC HYDROGEN ISOTOPE EXCHANGE INVOLVING A SERIES OF BENZOCYCLOALKENES

(L. C. Card No. Mic 60-964)

Thomas James Evensen, Ph.D.
University of Minnesota, 1959

The overall relative rates of deuteration of benzocyclobutene, indane, tetralin, benzsuberane, and benzocyclooctene as compared with *o*-xylene were determined at 70°C. using a deuterium oxidetrifluoroacetic acid mixture. The observed differences in reactivities of these compounds toward electrophilic hydrogen isotope exchange were not great, however the results indicated the following order of relative reactivities to prevail: Benzocyclobutene < *o*-xylene < indane < tetralin > (benzsuberane > benzocyclooctene).

Through reverse exchange methods the ratio of the reactivities of the 4- and 5- positions of indane was determined to be 0.23 and the ratio of reactivities of the 5- and 6- positions of tetralin was found to be 1.15.

It appears that the small differences observed in overall relative reactivities as well as the differences in reactivities of the two positions in indane and the two positions in tetralin, can be attributed, for the most part, to steric and strain characteristics of the compounds involved.

Preliminary deuteration studies were also performed on 1,4-methyleno-1,2,3,4-tetrahydronaphthalene, however the results obtained were inconclusive.

Microfilm \$2.50; Xerox \$4.60. 87 pages.

STEREOCHEMISTRY OF 1,2-CYCLOHEXANEDIOLS

(L. C. Card No. Mic 60-919)

Thomas Harley Fife, Ph.D.
University of Minnesota, 1959

Adviser: Stuart W. Fenton

An ester interchange reaction between diols and diethyl carbonate has been utilized to study the conformations of a series of cyclic vicinal glycols. Chemical support was given to the infrared evidence, which showed that *trans*-1,2-cyclohexanediol, 1-methyl-*trans*-1,2-cyclohexanediol, and 1-ethyl-*trans*-1,2-cyclohexanediol are capable of existence in the conformation in which both hydroxyl groups are equatorial, when it was found that these diols will form cyclic carbonate derivatives.

The hydroxyl groups of 1-isopropyl-*trans*-1,2-cyclohexanediol, 1-tert.-butyl-*trans*-1,2-cyclohexanediol, 1,2-dimethyl-*trans*-1,2-cyclohexanediol, and 1,2-diphenyl-*trans*-1,2-cyclohexanediol must be held exclusively in axial positions with no ring conversion taking place since the infrared spectra of these diols revealed that no intramolecular hydrogen bonding was present. Cyclic carbonate formation will not take place when the diol is in this conformation. In each of the above cases no carbonate could be obtained and the diol was recovered from the reaction mixture in high yield.

Intramolecular hydrogen bonding, as shown by the

infrared spectra, is present in all of the *cis*-1,2-cyclohexanediols studied. Cyclic carbonates were prepared in good yield from 1-methyl-*cis*-1,2-cyclohexanediol, 1-ethyl-*cis*-1,2-cyclohexanediol, 1-isopropyl-*cis*-1,2-cyclohexanediol and 1-phenyl-*cis*-1,2-cyclohexanediol, while in the case of 1-tert.-butyl-*cis*-1,2-cyclohexanediol and 1,2-dimethyl-*cis*-1,2-cyclohexanediol the rate of carbonate formation was slow and the product was obtained in low yield.

A ketal interchange reaction with acetone diethyl ketal was used to prepare isopropylidene ketals from some of the 1,2-cyclohexanediols which were studied. As with carbonate formation, in every case where ketal formation did not occur the two hydroxyl groups of the diol must be held in the diaxial configuration, but in those cases where the infrared spectrum of the diol showed the presence of intramolecular hydrogen bonding, reaction took place. The ketals of 1-ethyl-*cis*-1,2-cyclohexanediol, 1-ethyl-*trans*-1,2-cyclohexanediol, 1-isopropyl-*cis*-1,2-cyclohexanediol, and 1-tert.-butyl-*cis*-1,2-cyclohexanediol were prepared in good yield, while ketals could not be obtained from 1-isopropyl-*trans*-1,2-cyclohexanediol, 1-tert.-butyl-*trans*-1,2-cyclohexanediol, and 1,2-diphenyl-*trans*-1,2-cyclohexanediol.

Microfilm \$2.50; Xerox \$5.60. 114 pages.

I. CARBENOID AND CATIONOID DECOMPOSITION OF DIAZO HYDROCARBONS DERIVED FROM TOSYLHYDRAZONES. II. POLYCYCLIC AROMATIC ACIDS BY OXIDATION OF ALKYLARENES. III. NUCLEOPHILIC DISPLACEMENTS IN DIMETHYL SULFOXIDE: PREPARATION OF ALIPHATIC NITRILES AND NITRO COMPOUNDS. IV. AROMATIC NITRILES FROM HALIDES AND CUPROUS CYANIDE IN DIMETHYLFORMAMIDE.

(L. C. Card No. Mic 60-1181)

Lester Friedman, Ph.D.
The Ohio State University, 1959

I.

The reactions of tosyl(*p*-toluenesulfonyl)hydrazones with sodium methoxide in aprotic and protonic solvents were investigated at 150-250°. In aprotic media, the experimental conditions allow carbenic decomposition of diazo compounds generated *in situ* and minimize diazonium cationoid processes. The hydrocarbons and per cent composition obtained from the hydrazones of the following carbonyl compounds are (1) propanal: propene (90%), cyclopropane (10%); (2) butanal: 1-butene (92%), methylcyclopropane (5%), *trans*-2-butene (2%), *cis*-2-butene (1%); (3) 2-methylpropanal: 2-methylpropene (55%), methylcyclopropane (44%); (4) 2,2-dimethylpropanal: 1,1-dimethylcyclopropane (>92%); (5) 2-butanone: *trans*-2-butene (71%), *cis*-2-butene (23%), 1-butene (5%), methylcyclopropane (1%); (6) 3,3-dimethylbutanone: 3,3-dimethyl-1-butene (51%), 1,1,2-trimethylcyclopropane (48%); (7) cyclo-decanone: *trans*-cyclodecene (60%), *cis*-cyclodecene (40%); (8) cyclobutanone: methylenecyclopropane (80%), cyclobutane (15%); (9) cyclopropanecarboxaldehyde: cyclobutene (82%); (10) cyclopropyl methyl ketone:

1-methyl-1-cyclobutene (95%), (II) camphor: tricyclene (~100%). Diazo hydrocarbons were detected in some of the reaction mixtures. Hydrocarbon products obtained from thermal decomposition of diazo compounds prepared by authentic methods are similar to those derived from tosylhydrazones.

In protonic media, the yields of cyclopropanes are reduced and carbon-skeleton rearrangement products are formed. The nature of these products indicates that rearrangements of the Wagner-Meerwein type are occurring and are presumably proceeding through a diazonium cationoid intermediate.

It is thus concluded that diazo intermediates are formed from tosylhydrazones which decompose by carbenoid processes to form (1) olefins by hydrogen transfer and (2) cyclopropanes by intramolecular carbon-hydrogen insertion. These processes occur without carbon skeletal rearrangement except in small-ring diazo intermediates (e.g., diazocyclobutane, cyclopropyldiazomethane, cyclopropyldiazoethane) which prefer to undergo carbon skeleton rearrangement (ring expansion or contraction) presumably because of strong 1,3 interactions.

II.

Toluene, *o*-chlorotoluene, acenaphthene and *p*-toluic acid have been oxidized in good yields with aqueous sodium dichromate at 250° under pressure to give, respectively, benzoic, *o*-chlorobenzoic, 1,8-naphthalic, and terephthalic acids. (Ger. Pat. 573,582; BIOS Report 1786).

In the present investigation it has been found that polycyclic aromatic compounds such as naphthalene, phenanthrene, fluoranthene, chrysene, benzo [c] phenanthrene are not oxidized by hot aqueous sodium dichromate. However, alkylated derivatives can be oxidized to the corresponding arene carboxylic acids without concurrent nuclear oxidation. The following alkylpolyarenes were oxidized in good yields to the corresponding acid with aqueous sodium dichromate at 240-250°: 1- and 2-methylnaphthalene, 1,2-, 2,3-, 1,6-, 2,6-dimethylnaphthalene, 1-, 4-, 9-methylphenanthrene, 9,10-dimethylphenanthrene, 1-methyl-7-isopropylphenanthrene, 2-methyltriphenylene, 6-methylchrysene, 5-methylbenzo [c] phenanthrene, 4-methylfluoranthene.

III.

It has been found that dimethyl sulfoxide is an excellent reaction medium for effecting the synthesis of aliphatic and alicyclic nitriles and nitroalkanes from the corresponding halide and sodium cyanide or potassium nitrite, respectively. Yields are generally improved, reaction times shortened, and conversions that heretofore were unsuccessful are effected in moderate to good yields. The scope of the usefulness of dimethyl sulfoxide as a reaction medium for these conversions was investigated.

IV.

Reaction of aryl bromides and suitably activated aryl chlorides with cuprous cyanide to form nitriles is facilitated when dimethylformamide is used as the reaction medium. The usual difficulties (ammonia and/or hydrochloric acid treatment) of product isolation were overcome by employing (1) aqueous ferric chloride and hydrochloric acid, (2) aqueous ethylene diamine followed by 10% sodium cyanide or (3) excess aqueous sodium cyanide.

Microfilm \$3.30; Xerox \$11.70. 256 pages.

TOTAL SYNTHESIS OF dl-DIHYDROCORYNANTHEINE; THE STEREOCHEMISTRY OF l-EMETINE.

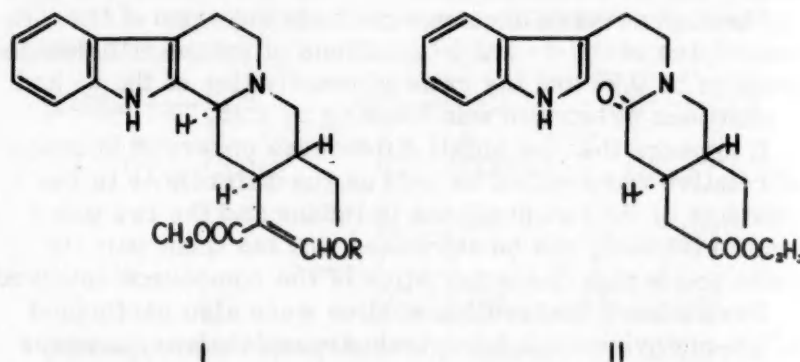
(L. C. Card No. Mic 60-999)

Jackson Boling Hester, Jr., Ph.D.
The University of Wisconsin, 1960

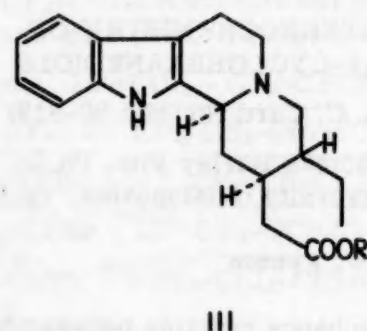
Supervisor: Professor Eugene E. van Tamelen

Part I

The total synthesis of dl-dihydrocorynantheine (I, R = CH₃) has been accomplished. Reductive alkylation of tryptamine with diethyl dl-β-(1-cyano-1-propyl)-glutarate yielded ethyl dl-trans-N-(β-3'-indolyl)-5-ethyl-2-piperidone-4-acetate (II). Bischler-Napieralski cyclization of II



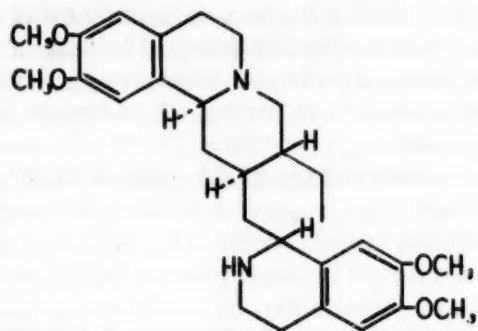
followed by catalytic reduction of the resulting imino salt produced the tetracyclic intermediate (III, R = C₂H₅). Formylation of III (R = CH₃), accomplished with triphenyl-



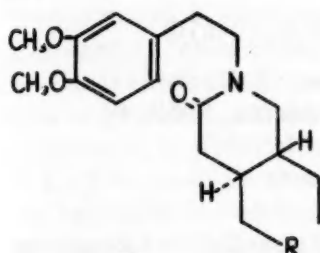
methyl sodium and methyl formate, yielded the crystalline hydroxymethylene derivative (I, R = H). Reaction of an ethyl acetate solution of I (R = H) with an excess of diazomethane yielded dl-dihydrocorynantheine which was purified as its crystalline hydrochloride. An infrared spectrum of the pure dl-base in chloroform was identical to that of a solution of the natural product in the same solvent.

Part II

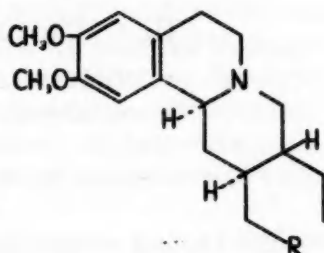
The stereochemistry of l-emetine (IV) has been unequivocally established. Key intermediates (V, R = COOCH₃ and VI, R = COOCH₃) of the original emetine synthesis (R. P. Evstigneeva, R. S. Livshits, M. S. Bainova, L. I. Zakharkin and N. A. Preobrazhenskii, J. Gen. Chem., 22, 1467 (1952); N. A. Preobrazhenskii, R. P. Evstigneeva, T. S. Levchenko and K. M. Fedivshkina, Doklady Acad. Nauk., USSR, 81, 421 (1951)) were isolated and degraded to the reference compounds (IV, R = CH₃ and V, R = CH₃), which were independently synthesized in a stereospecific



IV



V



VI

manner from 3,4-dimethoxyphenethylamine and ethyl dl-threo-5-bromo-3,4-diethylvalerate. Conversion of both V ($R = \text{COOCH}_3$) and VI ($R = \text{COOCH}_3$) into dl-emetine established the stereochemistry of the quinolizidine ring system of this natural product and of the related Ipecac bases: psychotrine, O-methylpsychotrine, emetamine and cephaline. The relative stereochemistry of emetine's fourth asymmetric center (C-1) was established by optical rotatory dispersion studies (cf. P. E. Aldrich, "Stereochemistry of the Corynantheine and Ipecac Alkaloids," Ph.D. Thesis, University of Wisconsin, 1958).

Microfilm \$2.50; Xerox \$5.40. 107 pages.

THE GENERATION OF CARBENES OR METHYLENES BY REACTION OF POLYHALIDES WITH ALKYL LITHIUM COMPOUNDS

(L. C. Card No. Mic 60-879)

Chung Sul Youn Kim, Ph.D.
Cornell University, 1960

In this research it has been shown that when some polyhalides are treated with an alkyl lithium in the presence of excess cyclohexene norcarane derivatives are formed. Experimental results are summarized in Table I.

The reactions of tetrahalomethanes with alkyl lithiums have been investigated most extensively. In these systems the formation of the dihalonorcaranes is postulated to take place by addition of a carbene intermediate which is generated as shown below with bromotrichloromethane and n-butyllithium.

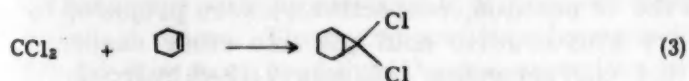
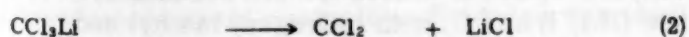
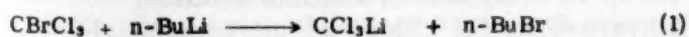


Table I

Reactants	RLi/CX ₄	Temp. °	Products, %		
				$\text{CH}_3\text{CH}=\text{CH}_2$	$\text{CH}_2=\text{CHCl}$
$\text{CCl}_4, \text{CH}_3\text{Li}$	3.8	-55	8	63	10
$\text{CCl}_4, \text{CH}_3\text{Li}$	0.91	6	21	39	12
$\text{CCl}_4, \text{BuLi}$	0.97	-55	50	0	0
$\text{CBrCl}_3, \text{CH}_3\text{Li}$	0.77	-55	67	very small amounts	
$\text{CBrCl}_3, \text{BuLi}$	0.77	-25	91	0	0
$\text{ClCl}_3, \text{CH}_3\text{Li}$	0.67	6	71	not determined	
				$\text{CH}_3\text{CH}=\text{CH}_2$	$\text{CH}_2=\text{CHCl}$
$\text{CH}_3\text{CCl}_3, \text{CH}_3\text{Li}$	4.2	5	10	32	0
				$\text{CH}_2=\text{CH}_2$	$\text{CH}_3\text{CH}_2\text{Br}$
$\text{CH}_2\text{Br}_2, \text{CH}_3\text{Li}$	1.15	-20	16	20	30
$\text{CH}_2\text{BrCl}, \text{CH}_3\text{Li}$	1.04	-20	6	4	65

Butyl bromide and lithium chloride were formed in essentially quantitative amounts along with 91% of dichloronorcarane in the above reaction. When the alkyl lithium was added to bromotrichloromethane in ether solution in the absence of cyclohexene at -60° , the immediate formation of lithium chloride as a white precipitate at the point of addition was observed. No chloroform could be obtained by rapid hydrolysis at the same temperature. This result showed that trichloromethyl lithium was not stable at -60° and that reactions (1) and (2) may consist of a single concerted process.

The above mechanism for dichlorocarbene formation is consistent with Hine's demonstration that the trichloromethyl anion breaks down to yield dichlorocarbene¹ and with Doering and Hoffmann's discovery that the dichlorocarbene produced in this way adds to cyclohexene at low temperature.² Evidence against the direct reaction of the trichloromethyl anion with an olefin to form a cyclopropane derivative as an alternate mechanism has been presented by Skell and Garner.³

The results obtained suggest that norcarane formation depends upon the occurrence of halogen-lithium interchange (1) as the initial reaction step. Side-products result from competing reactions which involve the initial formation of carbon-carbon bonds.

Microfilm \$2.50; Xerox \$8.20. 178 pages.

1. Hine, J. and Dowel, A. M., Jr., J. Am. Chem. Soc., **76**, 2688 (1954).

2. Doering, W. von E. and Hoffmann, A. K., *ibid.*, **76**, 6162 (1954).

3. Skell, P. S. and Garner, A. Y., *ibid.*, **78**, 5430 (1956).

CARBOHYDRATES OF THE COFFEE BEAN; ISOLATION OF A MANNAN.

(L. C. Card No. Mic 60-1193)

Murray Lane Laver, Ph.D.
The Ohio State University, 1959

The polysaccharide fractions of roast coffee and specially extracted spent coffee grounds were isolated by

successive extractions with 80/20::ethanol/water, 2/1:: benzene/ethanol, water, 0.5% ammonium oxalate, acidified aqueous sodium hypochlorite, and 10% potassium hydroxide.

The (10% potassium hydroxide)-insoluble holocellulose of green coffee was hydrolyzed by a new method employing anhydrous sulfuric acid, and contained the following ratio of sugars: L-arabinose, 1.0; D-glucose, 2.2; D-galactose, 1.8; and D-mannose, 6.2. D-galactose was isolated as crystalline galactaric (mucic) acid and as crystalline penta-O-acetyl- β -D-galactopyranose. L-Arabinose was isolated as the crystalline tetra-O-acetyl-L-arabinose diethyl dithioacetal. The x-ray powder diffraction data of these crystalline compounds are recorded.

In an effort to fractionate the (10% potassium hydroxide)-insoluble holocellulose of green coffee into homogeneous polysaccharides it was acetylated with trifluoroacetic anhydride and anhydrous acetic acid. The acetylation resulted in a chloroform-insoluble acetate (38.9% acetyl) and a chloroform-soluble acetate (29.8% acetyl). The chloroform-insoluble acetate was de-acetylated and hydrolyzed, and paper chromatography showed the presence of arabinose, glucose, galactose and mannose. The chloroform-soluble acetate was also de-acetylated, hydrolyzed, and shown to contain arabinose, glucose, galactose and mannose by paper chromatography. Thus a good separation was not accomplished by the acetylation.

The (10% potassium hydroxide)-insoluble holocellulose was extracted with 18% sodium hydroxide and separated into an (18% sodium hydroxide)-insoluble residue (79%) and an (18% sodium hydroxide)-soluble portion (21%).

The (18% sodium hydroxide)-soluble portion was neutralized to pH 5 with 50% acetic acid, resulting in a precipitate which was labeled Fraction-A (61.1% of the soluble portion). The decantate from Fraction-A was dialyzed to remove the salts and this resulted in a precipitate designated Fraction-B (1.4% of the soluble portion). Ethanol was added to the decantate from Fraction-B to make a 70% ethanol concentration. A precipitate formed which was labeled Fraction-C (15.3% of the soluble portion). The decantate from Fraction-C was lyophilized, yielding a fluffy white solid (20.8% of the soluble portion).

Fraction-A was hydrolyzed with formic acid, and paper chromatograms established the presence of mannose (94%) and galactose (2%) which showed it to be a mannan. The mannan was re-precipitated from 18% sodium hydroxide and complexed with Fehling solution, but neither method removed the small amount of galactose. D-Mannose phenylhydrazone was crystallized from the hydrolysis sirup of Fraction-A and its amount showed Fraction-A to be composed of 95% mannose residues.

Fraction-B was hydrolyzed with formic acid, and paper chromatograms showed the presence of mannose (69.1%), galactose (16.3%), and arabinose (8.9%). Fraction-C was also hydrolyzed with formic acid, and paper chromatograms indicated galactose (63.5%) and arabinose (19.0%). An hydrolysis of Fraction-D with formic acid resulted in galactose (65%) and arabinose (21%) by paper chromatography.

Fraction-A (a mannan) was methylated twice by dissolving it in 18% sodium hydroxide and adding dimethyl sulfate dropwise. The partially methylated polymer was dissolved in dry tetrahydrofuran and completely methylated with sodium hydroxide and dimethyl sulfate. The methoxyl content of the final product was 45.4%. Methylated Fraction-A was hydrolyzed with formic acid, and paper chro-

matograms indicated a great predominance of a tri-O-methyl sugar with an Rg value equal to that of 2,3,6-tri-O-methyl-D-mannopyranose. However, a crystalline derivative of 2,3,6-tri-O-methyl-D-mannopyranose has not been isolated.

Microfilm \$2.50; Xerox \$6.80. 145 pages.

I. A STUDY OF THE NEF REACTION
AND RELATED SYNTHESSES IN THE
9,10-DIHYDRO-9,10-ETHANOANTHRACENE
SERIES. II. BENZYLATION OF α -NITROESTERS.

(L. C. Card No. Mic 60-970)

Roland Libers, Ph.D.
University of Minnesota, 1959

Adviser: Dr. Wayland E. Noland

Results from a series of Nef reactions of 2-nitropropane at various acid concentrations indicate that air oxidation of 2-nitropropane in alkaline solution, which is known to yield nitrite ion and ketone, is important in the formation of the blue color observed during Nef reactions. Nitrosation by nitrite ion under the acidic Nef reaction conditions forms blue colored monomeric nitroso-nitro compounds. It was possible to diminish the intensity of the blue color and reduce drastically the yields of the nitroso-nitro compound [propyl pseudonitrole, $(\text{CH}_3)_2\text{C}(\text{NO})\text{NO}_2$] by performing the salt formation and Nef reaction under nitrogen. The presence of sulfamic acid eliminated the blue color almost completely and no pseudonitrole was isolated.

The visible absorption maxima of the Nef reaction mixture of sodio-2-nitropropane and of propyl pseudonitrole lie close together (643 and 649 m μ). The corresponding acetoxy-nitroso compound (2-acetoxy-2-nitrosopropane), which is structurally closer to 2-nitroso-2-propanol (the hypothetical blue colored Nef reaction intermediate), absorbs at somewhat longer wavelengths (661 m μ). The results tend to support the view that the blue color during Nef reactions in sulfuric acid may be due largely or solely to nitroso-nitro compounds.

It has been shown in the present study that the unidentified byproduct in the Nef reaction in hydrochloric acid of potassio-9,10-dihydro-9,10-(11-nitro-12-methylethano)-anthracene (IB) is 9,10-dihydro-9,10-(11-chloro-11-nitro-12-methylethano)-anthracene (IIIB), probably formed from oxidation of blue colored 9,10-dihydro-9,10-(11-chloro-11-nitroso-12-methylethano)-anthracene (IIB), formed during acidification with hydrochloric acid of IB.

The byproduct in the Nef reaction of IB in sulfuric acid is 9,10-dihydro-9,10-(11,11-dinitro-12-methylethano)-anthracene (VB), an oxidation product of the corresponding pseudonitrole - 9,10-dihydro-9,10-(11-nitro-11-nitroso-12-methylethano)-anthracene (IVB). The source of the nitrosating agent is thought to be nitrite ion from autooxidation of the nitro compound in alkaline solution.

9,10-Dihydro-9,10-(11-chloro-11-nitrosoethano)-anthracenes (IIA, B and C, with hydrogen, methyl and phenyl in the 12 position, respectively) were prepared by passing dry hydrochloric acid gas into ether suspensions of the corresponding potassio-9,10-dihydro-9,

10-(11-nitroethano)-anthracenes (IA, B and C). 9,10-Dihydro-9,10-(11-chloro-11-nitroethano)-anthracenes (IIA, B and C) were obtained by passing chlorine into aqueous methanolic solutions of IA, B and C. The chloro-nitro compound IIB (with methyl in the 12 position) was also obtained by oxidation of the blue colored chloro-nitroso compound IIB, a model reaction for that occurring during the Nef reaction.

9,10-Dihydro-9,10-(11-nitro-11-nitrosoethano)-anthracenes (IVA, B and C) were prepared by nitrosation of IA, B and C. These blue colored monomeric products were oxidized to the corresponding dinitro compounds - 9,10-dihydro-9,10-(11,11-dinitroethano)-anthracenes (VA, B and C) under conditions resembling those occurring during the Nef reaction and subsequent workup.

Pyrolysis of 9,10-dihydro-9,10-(11-chloro-11-nitroethano)-anthracenes (IIA, B and C) resulted in much reverse Diels-Alder reaction as well as some elimination of nitrous acid and formation of unsaturated compounds - 9,10-dihydro-9,10-(11-chloroetheno)-anthracenes (VIA, B and C). The possible stereochemical aspects of this elimination reaction are discussed.

In keeping with the current interest in the alkylation of ambident anions, alkylation of the α -nitroester system appeared to offer an attractive synthetic route to substituted α -amino acids. The previously reported C-allylation of α -nitroesters seemed to offer an attractive analogy for C-benzoylation as a synthetic route to phenylalanine and benzene-ring substituted phenylalanines.

Products resulting only from O-benzoylation were obtained from benzyl chloride and ethyl nitromalonate. Although C-benzoylation, as well as products from O-benzoylation, were observed from benzyl chloride and ethyl α -nitroacetate, the yield was small and the method appears to have limited practical value.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

THE EFFECTS OF IONIZING RADIATIONS ON CARBOHYDRATES AND RELATED SUBSTANCES

(L. C. Card No. Mic 60-1199)

Leo James McCabe, Ph.D.
The Ohio State University, 1959

Selected carbohydrates underwent color, organoleptic, and other physical changes on irradiation in the solid state.

Sucrose, irradiated as a powder and in 50 per cent aqueous solution, hydrolyzed to D-glucose and D-fructose. The extent of hydrolysis of aqueous sucrose increased with increasing irradiation dosage. Evidence was obtained that about 10 per cent of the sucrose was transformed to non-reducing substances. The effect of temperature on the irradiation process was followed by irradiating aqueous sucrose at three temperatures, ambient-air, ice and water, and ethanol-(solid carbon dioxide). The extent of hydrolysis, based on the yield of invert sugar, was greatest at the lowest temperature. The extent of hydrolysis of powdered sucrose as a function of dosage reached a maximum at an intermediate dose. G (invert sugar) was calculated for the irradiated sucrose samples. Evidence was obtained that cathode rays and gamma rays hydrolyze sucrose to about the same extent. The decomposition of sucrose by soft x-rays was much less than the decomposition by cathode rays and gamma rays.

Hydrolysis of methyl α -D-glucopyranoside to D-glucose by cathode rays was observed. The evidence is based on paper chromatography. The extent of hydrolysis based on the yield of D-glucose was measured by copper-reducing methods.

On irradiation in aqueous solution, a selective oxidation of D-glucitol (sorbitol) and D-mannitol occurred. Glucose, gulose, arabinose and xylose were obtained from the D-glucitol, while D-mannitol yielded mannose and arabinose. At high doses D-mannitol yielded some mannuronic acid.

The decomposition of D-glucose and D-fructose by cathode rays was observed. Paper chromatography indicated that D-glucose yielded arabinose. Three unidentified sugars, probably ketoses, were detected in the irradiated fructose. Both D-glucose and D-fructose decreased in reducing power on exposure to cathode rays. The decomposition was greater for D-fructose.

Corn starch and potato starch were extensively degraded by cathode rays. Dextrins of different physical characteristics were produced at different irradiation dosages. The alkali lability of irradiated corn starch and amylopectin was determined. The alkali number increased with increasing dosage in each case. Corn starch and amylopectin were water-soluble when irradiated in doses in the range of 90-100 megareps. D-Glucose, maltose, and isomaltose were isolated from irradiated amylopectin. These sugars were characterized by their crystalline acetate derivatives.

The effect of cathode rays on the Maillard Browning reaction was studied. The effect of moisture content on irradiated mixtures of D-xylose-glycine and D-glucose-glycine was determined. In both systems browning increased with increasing irradiation dosage. The extent of browning in the glycine-D-xylose system was greater than in the glycine-D-glucose system. Preliminary irradiation of the components markedly enhanced their susceptibility to browning with the enhancement being especially noticeable with the irradiated carbohydrate.

The electron spin resonance spectra for a number of irradiated carbohydrates were obtained. An attempt was made to indicate probable radicals that may be present which would be consistent with the observed spectra. Identical spectra were observed when the irradiation was done with cathode rays or soft x-rays.

Microfilm \$2.65; Xerox \$9.25. 203 pages.

SOLVENT AND SUBSTITUENT EFFECTS ON THE PRINCIPAL ULTRAVIOLET TRANSITION OF SOME PARA ALKYL BENZENE DERIVATIVES

(L. C. Card No. Mic 60-865)

Richard Bullock Murphy, Ph.D.
University of Washington, 1959

Chairman: W. M. Schubert

The positions of the principal band in the ultraviolet spectra of some p-alkylanilines and N,N-dimethyl-p-alkylanilines have been determined in the gas phase and in a number of solvents. The solution data offer support for the contention that the excitation of the aniline molecule by light results in an excited state in which the electron

migration is away from the functional group. Thus, any substituent in the *para* position must "accept" negative charge in order to stabilize the excited state. It is shown that all *p*-alkyl substituents stabilize the excited state relative to the ground state better than *p*-hydrogen. In the *p*-alkylanilines the order of excitation energy is found to be $H > t\text{-Bu} > \text{Me}$, while for the *N,N*-dimethyl-*p*-alkylanilines the order is $H > \text{Me} > t\text{-Bu}$. These results are discussed in terms of the "polarizability" of the *p*-alkyl groups.

The effect of the *p*-neopentyl group upon the position of the principal band of benzene derivatives is investigated. It is found that the *p*-neopentyl group exhibits a greater ability to stabilize the excited state relative to the ground state than the other alkyl groups (i.e. Me, *t*-Bu, etc.). This is true if the *p*-alkyl group is called upon to stabilize either an electron deficient ring or an electron rich ring. The stabilization due to the neopentyl group is discussed in terms of (1) polarizability of the C-C bond to the ring, (2) the effect of the α -*t*-butyl group on this C-C bond polarizability and (3) the possible interaction through space of the terminal methyls of the neopentyl group with the ring.

The effect of deuterium substitution on the ultraviolet spectra was investigated and it was found that the deuterium atom has a lower polarizability than does hydrogen. The deuterium isotope effect was used in an attempt to better understand the stabilizing effect of the *p*-neopentyl group by the preparation and determination of the spectra of *p*-neopentylnitrobenzene- α - d_2 , *p*-neopentylanilines- α - d_2 , *p*-neopentylnitrobenzene- γ - d_6 , *p*-neopentylaniline- γ - d_6 , and *p*-neopentylphenol- γ - d_6 . It was found that the introduction of a *t*-Bu group on the α carbon of *p*-nitrotoluene causes a decrease in the relative importance of the α -hydrogens in the stabilization of the excited state. An isotope effect is also observed for the neopentyl- γ - d_6 derivatives and this is taken as evidence that there is interaction between the ring and the terminal methyls of the neopentyl group. Microfilm \$2.50; Xerox \$6.00. 121 pages.

A STUDY OF THE DECOMPOSITIONS OF SUBSTITUTED HYDROXYLAMINES AND HYDRAZINES

(L. C. Card No. Mic 60-1154)

Anthony Nicholas Naglieri, Ph.D.
Columbia University, 1959

Diacyl peroxides, diacyl hydrazines and diacyl hydroxylamines have similar structures. With rare exceptions the peroxides normally dissociate via a free radical path while the hydroxylamines undergo the preferred Lossen rearrangement. The diacyl hydrazines are relatively stable.

The decomposition of dibenzoylhydroxylamine in refluxing toluene gives initially benzoic acid and phenyl isocyanate which eventually react to give carbanilide, benzanilide, carbon dioxide, γ -triphenyl biuret and benzoic anhydride. Although dibenzoylhydroxylamine slowly initiates the polymerization of methyl methacrylate and gives a copolymer containing approximately 50% styrene in the copolymerization of styrene-methyl methacrylate, no

products resulting from a free radical dissociation were obtained. The rates of rearrangement of dibenzoylhydroxylamine and a number of substituted dibenzoylhydroxylamines (*p*- and/or *p'*-methoxy, and/or *p*- or *p'*-nitro, and *N*-deutro-) were determined in refluxing toluene by adding an excess of aniline and titrating the unreacted aniline with perchloric acid in glacial acetic acid. The reaction proved to be of the first order and a mechanism is proposed which involves the formation of an ion-pair in the transition state.

The photolysis of dibenzoylhydroxylamine or the highly polar *N*-anisoyl-(*p*-nitrobenzoyl)-hydroxylamine in acetone or chloroform resulted in a homolytic cleavage of the (N-O) bond. The evidence is twofold: 1. The very fast photochemical initiation of methyl methacrylate polymerization when dibenzoylhydroxylamine is present. 2. When irradiated with a low pressure mercury lamp, dibenzoylhydroxylamine in chloroform gave benzamide, benzoic acid, benzene, carbon dioxide, and hexachloroethane. *N*-anisoyl-(*p*-nitrobenzoyl)-hydroxylamine in acetone gave anisamide, *p*-nitrobenzoic acid, nitrobenzene, carbon dioxide, carbon monoxide and tars.

N-Phthalimidophthalimide, sym-dibenzoyldimethylhydrazine, *N,N'*-diacetylhydrazobenzene, tribenzoylhydrazine, sym-dibenzoylhydrazine and *N*-trichloroacetylhydrazobenzene were studied as to their effect on the thermal and photochemical polymerizations of styrene and methyl methacrylate. In general, as initiators they are very inefficient and dissociate to a small extent into free radicals but only at relatively high temperatures. Tetraphenylhydrazine was found to retard the photochemical and thermal polymerization except at temperatures greater than 150°C. where an opposite effect was noted resulting in a very fast rate of polymerization.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

A NEW REARRANGEMENT OF PHENYL AZIDE

(L. C. Card No. Mic 60-1155)

Robert A. Odum, Ph.D.
Columbia University, 1959

The photo and thermal decomposition of phenyl azide in various solvents results in a new rearrangement, unknown for aromatic azides.

The photochemical reaction of phenyl azide in diethylamine yielded 2-diethylamino-1-aza-1,3,5-cycloheptatriene. When 2-diethylamino-1-aza-1,3,5-cycloheptatriene was hydrogenated, two moles of hydrogen were absorbed and 2-diethylamino-1-aza-1-cycloheptene was formed. Basic hydrolysis of 2-diethylamino-1-aza-1-cycloheptene produced diethylamine and ϵ -aminocaproic acid.

The thermal decomposition of phenyl azide in aniline yielded 2-phenylimino-1-aza-3,5-cycloheptadiene. Hydrogenation of 2-phenylimino-1-aza-3,5-cycloheptadiene gives a tetrahydro-derivative, 2-phenylimino-1-aza-cycloheptane, which was hydrolyzed to ϵ -aminocaproic acid and aniline. Treatment with hydrogen sulfide converted 2-phenylimino-1-aza-3,5-cycloheptadiene to 2-thienoketo-1-aza-cycloheptadiene.

The photochemical decomposition of phenyl azide in

liquid ammonia gave 2-imino-1-aza-3,5-cycloheptadiene. Hydrolysis of 2-imino-1-aza-3,5-cycloheptadiene produced 2-keto-1-aza-3,5-cycloheptadiene which was hydrogenated to 2-ketohexamethylenimine. Treatment by hydrogen sulfide converted 2-imino-1-aza-3,5-cycloheptadiene to 2-thienoketo-1-aza-3,5-cycloheptadiene.

The photochemical reaction of phenyl azide in ether saturated with hydrogen sulfide gave 2-thienoketo-1-aza-3,5-cycloheptadiene.

The photochemical decomposition of phenyl azide in trimethylamine with a mole equivalent of aniline produced 2-phenylimino-1-aza-3,5-cycloheptadiene.

Acylation of the cyclic amidines, obtained from the decomposition of phenyl azide, resulted in a novel rearrangement in which an aromatic ring is formed. Acetylation of 2-phenylimino-1-aza-3,5-cycloheptadiene with acetic anhydride gave *o*-acetamidodiphenylamine. Treatment of 2-diethylamino-1-aza-1,3,5-cycloheptatriene with *p*-nitrobenzoyl chloride in pyridine produced *o*-(*p*-nitrobenz-amido)-diethylaniline.

Phenyl azide was reduced to aniline by two new reductive methods. Treatment of a solution of phenyl azide with hydrogen sulfide gave aniline, nitrogen and sulfur. The addition of phenyl azide to a solution of potassium amide in liquid ammonia produced aniline.

Microfilm \$2.50; Xerox \$3.80. 66 pages.

SYNTHESIS OF ANGULARLY SUBSTITUTED OCTA- AND DECAHYDROQUINOLINES

(L. C. Card No. Mic 60-939)

Daryl Lee Ostercamp, Ph.D.
University of Minnesota, 1959

In 1950 Koelsch and Walker (J. Am. Chem. Soc., 72, 346 (1950)) reported the synthesis of angularly substituted Δ^8 -octahydro-2,7-quinolinediones by acid catalyzed ring closure of γ -acetylpimelonitriles, compounds derived from the Bruson reaction. Since the cyclization proceeds in acceptable yields and utilizes inexpensive and common starting materials, this method for synthesis of the quinoline skeleton is very attractive.

The present work is concerned with extension of the usefulness of this method with emphasis on synthesis of angularly substituted octa- and decahydroquinolines. To this end the appropriate Δ^8 -octahydro-2,7-quinolinediones were treated with several reagents including lithium aluminum hydride, molecular hydrogen, and Grignard reagents.

Treatment of 1-methyl-4a-phenyl- Δ^8 -octahydro-2,7-quinolinedione (I) with excess phenylmagnesium bromide resulted in the formation of 1,4-diphenyl-4-(2-benzoyl-ethyl)-cyclohex-1-en-3-one (mp. 193-5°). Proof of structure was provided by means of an independent synthesis from phenylvinyl ketone and phenyl acetone. Chromic acid oxidation of the cyclohexenone proceeded as expected to give 3-phenyl-3,3-bis-(2-benzoyl-ethyl)-2-oxopropionic acid (mp. 256-9°d).

Deviation from the literature (J. Am. Chem. Soc., 72, 346 (1950)) was observed when the hydrogenation (Ni) of 4a-phenyl- Δ^8 -octahydro-2,7-quinolinedione (II) was repeated at 165° and 1000 lbs. pressure. For 7-hydroxy-4a-

phenyldecahydro-2-quinolone (mp. 227-9°) was isolated in 48% yield as compared to the reported quantitative yield; a substantial difference in melting points was also noticed. A second compound, 4a-phenyl- Δ^8 -octahydro-2-quinolone (III; mp. 211-14°; rep. mp. 208-10°, D. Elad and D. Ginsberg, J. Chem. Soc., 4137 (1953)), was obtained, but in low yield (6%). In contrast to these results, catalytic reduction of II over palladium on carbon gave III as the only product, in 63% yield.

Hydrogenolysis of the 7-carbonyl occurred during the hydrogenation of I in the presence of palladium on carbon; the product was 1-methyl-4a-phenyl- Δ^8 -octahydro-2-quinolone (IV, mp. 112.5-114°).

When II was treated with excess lithium aluminum hydride, hydrogenolysis of both carbonyls occurred to give an imine, 4a-phenyl- $\Delta^{1,8a}$ -octahydroquinoline (V, bp. 168-9° at 15 mm.). Hydrogenation of V over Raney nickel produced 4a-phenyldecahydroquinoline, a known compound (VI; Boeckelheide, J. Am. Chem. Soc., 69, 790 (1947)). Both the N-benzoyl (mp. 156.5-157.5°) and N-phenylacetyl (mp. 106-107.5°) derivatives of VI were prepared. Transformation of 1-phenylacetyl-4a-phenyldecahydroquinoline into 1-(2-phenylethyl)-4a-phenyldecahydroquinoline (VII) was accomplished with lithium aluminum hydride. The hydrochloride (mp. 228-30°) and hydrobromide (mp. 243-4°) salts of VII are being screened for pharmacological value.

The chemical reduction of 1-methyl-4a-phenyl- Δ^8 -octahydro-2,7-quinolinedione (I) with excess lithium aluminum hydride again resulted in hydrogenolysis of both carbonyls, giving a β,γ -unsaturated amine, 1-methyl-4a-phenyl- Δ^7 -octahydroquinoline (VIII, bp. 172-3° at 13mm., mp. 57-9°). In order to confirm that the reduction product was VIII and not 1-methyl-4a-phenyl- Δ^8 -octahydroquinoline (IX, bp. 125-7° at 3 mm.), it was necessary to synthesize IX. Both mercuric acetate oxidation (Leonard, Miller, and Thomas, J. Am. Chem. Soc., 78, 3463 (1956)) of 1-methyl-4a-phenyldecahydroquinoline (Sugimoto, Kugita, and Fujita, C. A., 50, 1814 (1956)) and lithium aluminum hydride reduction of 1-methyl-4a-phenyl- Δ^8 -octahydro-2-quinolone (IV) were satisfactory methods for the preparation of IX.

The above work, to the author's knowledge, represents the first reported reactions of alicyclic vinylogues of an imide with lithium aluminum hydride and Grignard reagents. It would appear that these results will be of general use in the synthesis of angularly substituted octa- and decahydroquinolines. Suitable methods are available for concurrent alkylation of the basic nitrogen.

Microfilm \$2.50; Xerox \$3.80. 68 pages.

**PART I: THE SYNTHESIS AND REACTIONS
OF GLYCIDONITRILES.**

**PART II: STUDIES IN THE SYNTHESIS OF
SOME SIX-MEMBERED RING
 β -KETO ESTERS.**

(L. C. Card No. Mic 60-1158)

James J. Pappas, Ph.D.
Columbia University, 1959

PART I.

**THE SYNTHESIS AND REACTIONS
OF GLYCIDONITRILES.**

Carbonyl compounds were found to condense smoothly with α -chloro nitriles in the presence of potassium t-butoxide to form glycidonitriles. The reactions of glycidonitriles with hydrogen chloride, boron trifluoride etherate, aluminum chloride, lithium aluminum hydride and triphenylphosphine were studied.

PART II.

**STUDIES IN THE SYNTHESIS OF SOME
SIX-MEMBERED RING β -KETO ESTERS.**

The Dieckmann condensation of diethyl β -methylpimelate, ethyl 6-cyano-5-methylhexanoate, diethyl cis- and trans-cyclohexane-1-acetate-2-propionate and diethyl o-phenyleneacetatepropionate was studied.

The reactions of the enamines of cis- and trans-2-decalone with ethyl chlorocarbonate and methyl vinyl ketone were also investigated.

Microfilm \$2.50; Xerox \$5.80. 119 pages.

**THE SYNTHESIS AND REACTIONS OF
HINDERED ACRIDINES**

(L. C. Card No. Mic 60-1207)

Warren Howard Powell, Ph.D.
The Ohio State University, 1959

The hindered acridines, 4,5-dimethylacridine (I) and 1,4,5,8-tetramethylacridine (II), were found to form hydrochlorides and hydrobromides as well as trinitrobenzene complexes, but showed no reaction with either boron trifluoride or diborane. Solutions of pyridine, 2,4,6-collidine and acridine in benzene showed significant temperature rises, 8-10° and 4-5° respectively, when treated with boron trifluoride or diborane. Solutions of I and II in benzene showed no temperature rise under the same conditions.

3-Methylantranilic acid was obtained in 34% overall yield in three steps from commercial 2-methylfuran and maleic anhydride.

4,5-Dimethylacridine (I) was synthesized by two routes. 3-Methylantranilic acid was condensed with o-bromotoluene to give 2',6-dimethyldiphenylamine-2-carboxylic acid (III) in 76% yield. Cyclization of III with phosphorous oxychloride gave 9-chloro-4,5-dimethylacridine (IV) in 89% yield. Reduction of IV with either Raney Nickel and hydrogen or lithium aluminum hydride followed by oxida-

tion with potassium dichromate and dilute sulfuric acid gave I in 83% and 77% yields respectively. The overall yield of I was 52-56%.

Condensation of N-formyl-o-toluidine with o-bromotoluene followed by hydrolysis with a hydrochloric-acetic acid mixture gave di-o-tolylamine (V) in 38% yield. Condensation of V with oxalyl chloride gave di-o-tolyloxamide acid chloride which was cyclized to 1-o-tolyl-7-methylisatin (VI) in 92% yield by aluminum chloride. Rearrangement of VI in dilute base gave 4,5-dimethylacridine-9-carboxylic acid (VII) in 99% yield, which was decarboxylated in 87% yield to give I. The overall yield of I was 30%.

2,5-Dimethylaniline was condensed with 1-bromo-2,5-xylene in the presence of metallic potassium to give di-2,5-xylylamine (VIII) in 74% yield. Condensation of VIII with oxalyl chloride gave di-(2,5)-xylyloxamide acid chloride which was cyclized to 1-(2,5)-xylyl-4,7-dimethylisatin (IX) in 96% yield by aluminum chloride. 1,4,5,8-Tetramethylacridine (II) was synthesized from this isatin by two routes.

Rearrangement of IX in dilute base gave 1,4,5,8-tetramethylacridine-9-carboxylic acid (X) in 79% yield which was decarboxylated in 94% yield to give II. The overall yield from 2,5-dimethylaniline was 53%.

Oxidation of IX with alkaline hydrogen peroxide gave 2',3,5',6-tetramethyldiphenylamine-2-carboxylic acid (XI) in 92% yield. Cyclization of XI with phosphorous oxychloride afforded 9-chloro-1,4,5,8-tetramethylacridine (XII) in 58% yield along with 1,4,5,8-tetramethylacridone (XIII) in 26% yield. Reduction of XII either with Raney Nickel and hydrogen or lithium aluminum hydride followed by oxidation with potassium dichromate and dilute sulfuric acid gave II in 76% and 74% yields respectively. The overall yield from 2,5-dimethylaniline was 28%.

Treatment of 2-bromocholestan-3-one with 4,5-dimethylacridine in refluxing dimethylacetamide or in N-methylpyrrolidone at 170-175° gave 65% and 94% yields of 4,5-dimethylacridine hydrobromide. In each case, about 70% crude Δ^1 -cholesten-3-one was isolated.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

FREE-RADICAL ADDITIONS TO OLEFINS

(L. C. Card No. Mic 60-1043)

James Alfred Reeder, Ph.D.
University of Colorado, 1959

Supervisor: Professor Stanley J. Cristol

Previous study has shown that the addition of p-thiocresol to norbornadiene (bicyclo [2,2,1] hepta-2,5-diene) under free-radical conditions leads to a mixture of *exo*-5-norbornen-2-yl p-tolyl thioether by 1,2-addition and 3-nortricyclyl p-tolyl thioether by homoconjugative addition. In the present investigation it was found that the proportion of 3-nortricyclyl p-tolyl thioether in the product decreases with increasing concentration of mercaptan. Thus the reaction has been shown to involve addition of a thiyl radical to norbornadiene to give an *exo*-p-tolylthionorbornenyl radical which may either undergo chain transfer with the mercaptan to give the 1,2-addition product or isomerize to a p-tolylthionortricyclyl radical which undergoes chain transfer to give the homoconjugative addition product.

Evidence is given to indicate that the two addition products do not result from a single intermediate such as a "non-classical" mesomeric homoallylic radical.

In order to study the mechanism of free-radical additions to conjugated diolefins, *p*-thiocresol was added to butadiene. The product of 1,4-addition, *trans*-2-butenyl *p*-tolyl thioether (crotyl *p*-tolyl thioether), was formed in greater than 92% yield in this reaction. No *cis*-2-butenyl *p*-tolyl thioether or the anticipated product of 1,2-addition, α -methylallyl *p*-tolyl thioether, was formed in measurable amount.

The addition of a second mole of *p*-thiocresol to crotyl *p*-tolyl thioether was found to proceed with rearrangement to give 14% of 1,4-di-*p*-thiocresoxybutane. The structure of this product was proved by independent synthesis. A mechanism for the *p*-thiocresol-butadiene reaction is postulated to account for the products formed.

Several free-radical additions to norbornene (bicyclo [2,2,1] heptene-2) and its derivatives have been previously reported to proceed without rearrangement, yielding the products of *cis*-*exo* addition. In order to gain additional information on free-radical additions to bicyclic olefins, *p*-toluenesulfonyl chloride was added to norbornene, Aldrin (*endo*-*exo*-1,2,3,4,9,9-hexachloro-1,4,4a,5,6,7,8,8a-hexahydro-1-4,5-8-dimethanonaphthalene) and norbornadiene. The addition of *p*-toluenesulfonyl chloride to norbornene was found to give 63-92% of the product of *trans*-addition without rearrangement, *exo*-2-*p*-toluenesulfonyl-*endo*-3-chloronorbornane. The free-radical nature of the *p*-toluenesulfonyl chloride-norbornene reaction has been demonstrated.

An analogous product of *trans*-addition without rearrangement was formed in 13% yield in the addition of *p*-toluenesulfonyl chloride to Aldrin.

The addition products of *p*-toluenesulfonyl chloride with norbornene and Aldrin were known compounds, and were identified by comparison with samples obtained from other sources. The *trans*-addition of *p*-toluenesulfonyl chloride to these olefins has been rationalized in terms of the large steric requirement of the *p*-toluenesulfonyl group.

The addition of *p*-toluenesulfonyl chloride to norbornadiene was found to proceed with rearrangement, to give 3-*p*-toluenesulfonyl-5-chloronorbornene in 43% yield. Evidence has been presented for the structure of this product.

A free-radical reaction is known to occur between sulfuryl chloride and many olefins, leading to the addition of the elements of chlorine with simultaneous evolution of sulfur dioxide. A study of the reaction of sulfuryl chloride with norbornene was undertaken in the hope that the stereochemistry of the free-radical addition of chlorine to norbornene could be investigated by this means. The reaction was observed to proceed with rearrangement, to form 39.4% of 3-norbornyl chloride and 27.4% of *exo*-2-*syn*-7-dichloronorbornane. These two compounds are known, and were identified by comparison of their physical properties with published values. A copolymer of norbornene and sulfur dioxide was also a product in the reaction, along with higher-boiling compounds which were not identified.

An ionic mechanism has been postulated for the sulfuryl chloride-norbornene reaction to account for the observed rearrangement.

Microfilm \$2.50; Xerox \$7.40. 157 pages.

ELECTROPHILIC HYDROGEN-DEUTERIUM EXCHANGE OF SOME POLYNUCLEAR AROMATIC HYDROCARBONS

(L. C. Card No. Mic 60-972)

David E. Rice, Ph.D.
University of Minnesota, 1959

The initial rates of deuteration of a number of aromatic hydrocarbons have been determined. Exchanges were carried out at 70° using homogeneous solutions composed of the aromatic hydrocarbon, trifluoroacetic acid and deuterium oxide. In some cases, it was necessary to add benzene to the mixture in order to obtain a homogeneous solution. Deuterium analyses were obtained by combustion of the hydrocarbon and conversion of the water formed to a mixture of H₂ and HD, which was analyzed mass spectrographically.

Each aromatic ring of triptycene was found to react 0.1 times as fast as *o*-xylene, while each ring of 1,2,5,6-dibenzcyclooctadiene was found to react 0.9 times as fast as *o*-xylene.

In the series of compounds: toluene, diphenylmethane, triphenylmethane, tetraphenylmethane and benzene, the relative reactivities per aromatic ring were found to be in the order 158:37:11:7:1.

The three isomeric monodeuterobiphenyls were prepared and dedeuterated in an excess of protonating reagent, composed of trifluoroacetic acid and water. From the rate constants thus obtained and from the reactivity of biphenyl relative to benzene, the partial rate factors of the 2-, 3- and 4-positions of biphenyl were found to be 82, 4.9 and 130, respectively.

By a similar method, the partial rate factors of the 2'-, 3'- and 4'-positions of 4-methylbiphenyl were found to be 360, 5.2 and 490, respectively.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

MECHANISMS OF ELIMINATION REACTIONS: THE HOFMANN ELIMINATION.

(L. C. Card No. Mic 60-1048)

Frank Richard Stermitz, Ph.D.
University of Colorado, 1959

Supervisor: Professor Stanley J. Cristol

Although the relative ease of *trans* elimination as compared to *cis* elimination has been quantitatively studied for a number of reactions, this has not previously been done for the Hofmann elimination. The present study was undertaken to determine the extent to which the stereochemical relationships effect the rate of olefin formation from tetraalkylammonium and trialkylsulfonium salts in the presence of base.

cis- and *trans*-2-Phenylcyclohexyltrimethylammonium iodides were synthesized from 2-phenylcyclohexanone. From the ketone, a mixture of isomeric amines was prepared via the Leuckart reaction or by reducing the ketone oxime with lithium aluminum hydride. The *cis* and *trans* amines were separated by alumina chromatography of the

corresponding benzamide derivatives. *cis*-2-Phenylcyclohexyldimethylsulfonium iodide was prepared from the corresponding methyl sulfide which was obtained by the addition of methanethiol to 1-phenylcyclohexene or by the reaction of sodium methyl mercaptide with *trans*-2-phenylcyclohexyl *p*-toluenesulfonate. The *cis* methyl sulfide could be converted to the sulfone which was found to isomerize in ethanolic base to the *trans* sulfone. This could then be reduced with lithium aluminum hydride to the *trans* sulfide which in turn was converted to the methiodide. These two isomeric pairs of 'onium salts were then treated with ethanolic potassium hydroxide and the rate of formation of 1-phenylcyclohexene followed by ultraviolet analysis. The rate of formation of styrene from 2-phenylethyltrimethylammonium bromide under the same conditions was also determined. As a further comparison, *cis*- and *trans*-2-phenylcyclohexyl *p*-toluenesulfonates were synthesized from a mixture of the alcohols and their rates of elimination to 1-phenylcyclohexene was also studied.

It was found that at 25° the rate of formation of 1-phenylcyclohexene from the *cis* sulfonium iodide was about 380 times faster than from the *trans* iodide and that the rate of olefin formation from the *cis* ammonium iodide was about 130 times faster than from the corresponding *trans* isomer. It was found that the rate of formation of styrene from 2-phenylethyltrimethylammonium bromide was about 80 times faster than the rate of formation of 1-phenylcyclohexene from the *cis* ammonium iodide. This was in contrast to the finding that the rates of formation of 1-phenylcyclohexene from the *cis* sulfonium iodide and the *cis* tosylate were of the same order of magnitude as the rates of formation reported in the literature from the corresponding 2-phenylethyl compounds to styrene. It was suggested that elimination from the *cis* ammonium iodide was unusually slow because of the difficulty which the bulky trimethylammonium group would encounter in taking up an axial position in the transition state. Although the differences in rate of *cis* and *trans* elimination are large, they are considerably less than might have been expected from the results of other work on compounds such as alkyl halides. This may be due to the fact that the 'onium compounds carry a positive charge while the alkyl halides are neutral. The possibility exists that the *trans* 'onium compounds may be isomerizing to the *cis* isomers under the reaction conditions and that hence the rate of formation of 1-phenylcyclohexene in these cases would not reflect the rate of *cis* elimination. The *trans* tosylate, which presumably would not isomerize, yielded considerable 3-phenylcyclohexene in addition to the 1-phenylcyclohexene while the *trans* 'onium compounds only gave traces of the 3-olefin. These results would be explicable on the basis of an isomerization of the *trans* 'onium salts.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

PART I: A STUDY OF A NEW RING
ENLARGEMENT SEQUENCE.
PART II: A POSSIBLE BIOGENETIC SCHEME
FOR THE SYNTHESIS OF INDOLE ALKALOIDS.

(L. C. Card No. Mic 60-1163)

Karl George Untch, Ph.D.
Columbia University, 1959

Part I. The reaction of the pyrrolidine enamine of cyclohexanone with acrolein was previously found to give 2-N-pyrrolidylbicyclo(3,3,1)nonan-9-one (I), whose methiodide on heating with aqueous base is converted to $\Delta^{4,5}$ -cyclooctenoic acid (G. Stork and H. K. Landesman, *J. Amer. Chem. Soc.*, **78**, 5129 (1956)). The investigations described here establish the versatility and limitations of these reactions. The preparation of I was carried out in dioxane, benzene, and ethanol under varying conditions. Bicyclo amino-ketones were prepared in benzene solution from cyclohexanone, α -methylcyclohexanone, cycloheptanone, 4-*t*-butylcyclohexanone, and cyclotridecanone using pyrrolidine, morpholine and piperidine in selected cases as the amine component and acrolein, methacrolein, and crotonaldehyde. With ethanol as solvent, the pyrrolidine enamine of cyclohexanone reacted with methacrolein and crotonaldehyde gave ethyl α -methyl- β -(2-N-pyrrolidylcyclohexyl)-propionate and ethyl β -methyl- β -(2-N-pyrrolidylcyclohexyl)-propionate.

Ring enlargement was carried out by heating in aqueous base the methiodides of 2-N-morpholylbicyclo(3,3,1)nonan-9-one, 3-methyl-2-N-pyrrolidylbicyclo(3,3,1)nonan-9-one, 4-methyl-2-N-pyrrolidylbicyclo(3,3,1)nonan-9-one and 2-N-morpholylbicyclo(4,3,1)decan-10-one to give $\Delta^{4,5}$ -cyclooctenoic acid, 2-methyl $\Delta^{4,5}$ -cyclooctenoic acid, 3-methyl- $\Delta^{4,5}$ -cyclooctenoic acid and $\Delta^{4,5}$ -cyclononenoic acid respectively. With the large ring ketone, cyclotridecanone, the ring enlargement sequence does not appear to be of much practical value.

The mechanism for the formation of the bicyclo amino-ketones (cf. I) was shown to involve an inter- rather than intra-molecular transfer of the secondary cyclic amine from the keto carbon to the aldehyde carbon during some stage of the reaction. Reaction of equimolar amounts of the pyrrolidine enamine of cyclohexanone and the piperidine enamine of 4-*t*-butylcyclohexanone with acrolein produced the four bicyclo amino-ketones resulting from mixing of the amine and ketone moieties rather than the two which would have been required by an intramolecular mechanism.

Part II. Attempts were made to synthesize a glutaraldehyde (or an equivalent) substituted at the β -carbon with a 2 carbon chain suitable for condensation with tryptamine. A compound of this structure could provide laboratory analogies for some of the possible stages of biogenesis of strychnos and/or yohimbe alkaloids.

4-Carboxymethylcyclopenta-1,2-diol was synthesized. Dimethyl acetonedicarboxylate was condensed with ethyl cyanoacetate to give the β -glutarylidenecyanoacetate, which was catalytically reduced to the saturated compound. Acid hydrolysis and decarboxylation gave an improved synthesis of the known methanetriacetic acid. Methanetriacetic acid was esterified with ethanol to give the triethyl ester, which underwent base-catalyzed condensation with

ethyl oxalate to yield 3,5-dicarbethoxy-4-carbethoxymethylcyclopenta-1,2-dione. Acid hydrolysis and decarboxylation of the triesterdione gave 4-carbethoxymethylcyclopenta-1,2-dione, which was catalytically reduced to the corresponding diol.

This diol, 4-carbethoxymethylcyclopenta-1,2-diol, is of interest since condensation with tryptamine should produce, after glycol cleavage, a substituted glutaraldehyde with possible application to further synthetic studies in the indole alkaloid. Microfilm \$2.50; Xerox \$5.20. 105 pages.

PART I: UNIMOLECULAR ALKYL-OXYGEN FISSION IN REACTIONS OF 2-BROMO-2,2-DINITROETHYL ACETATE.

PART II: A DIRECT SYNTHESIS OF TETRAZOLES FROM ALDEHYDES.

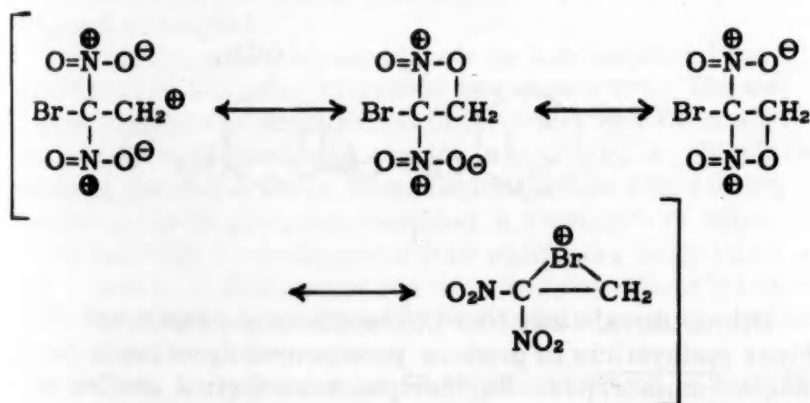
(L. C. Card No. Mic 60-905)

Lawrence Joseph Winters, Ph.D.
University of Kansas, 1959

Part I

The reaction of 2-bromo-2,2-dinitroethyl acetate with the potassium or sodium salt of ethylenedinitramine does not yield the potassium (or sodium) salt of 1,1,3,6,8,8-hexanitro-3,6-diazaoctane but rather 1,8-dibromo-1,1,3,6,8,8-hexanitro-3,6-diazaoctane. This anomalous result casts much doubt on the suggestion found in the literature that 1,1-dinitroethylene is formed as an intermediate in reactions of this type. The solvolysis with methanol of 2-bromo-2,2-dinitroethyl acetate gives rise to 2-bromo-2,2-dinitro-1-methoxyethane. The kinetics of this reaction have been studied ($k=0.141 \pm 0.003 \text{ hr}^{-1}$ at 35.22°) and found to be consistent with a unimolecular process. It was concluded from the above results that the ester is probably cleaved by a $B_{AL}1$ -type mechanism.

The solvolysis of 2-bromo-2,2-dinitroethanol with methanol under neutral conditions affords 2-bromo-2,2-dinitro-1-methoxyethane. The kinetics of this reaction have been studied. The ease of fission of the alkyl-oxygen bond indicates that the carbonium ion,



is a relatively stable species. The reason for this lies mainly in the ability of the oxygen atoms of the nitro groups to donate a share in a pair of p electrons to the positive carbon of the carbonium ion.

Part II

It has been demonstrated that 1-phenyl-5-aminotetrazole may be prepared in good yield from benzaldehyde and an excess of hydrogen azide (5 moles of HN_3 to 1 mole of benzaldehyde) in the presence of sulfuric acid. The reaction of benzaldehyde with an excess of hydrogen azide in the presence of stannic chloride affords a small yield of 1-phenyltetrazole under typical Schmidt reaction conditions. The acids boron trichloride and trichloroacetic acid are ineffective as catalysts for the formation of tetrazoles from benzaldehyde.

It was determined by a detailed study of the Schmidt reaction of m-nitrobenzaldehyde that m-nitrobenzonitrile is the probable intermediate in the formation of 1-m-nitrophenyl-5-aminotetrazole. The conditions that are conducive to the formation of tetrazoles from aldehydes are (a) the presence of excess hydrogen azide, (b) initial conditions of the reaction to favor formation of the aromatic nitrile over the aromatic amine, i.e. use of a low sulfuric acid concentration and (c) final conditions of the reaction to favor conversion of the aromatic nitriles to the 5-aryl-5-aminotetrazoles, namely the eventual addition of enough concentrated sulfuric acid to give a high acid concentration.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

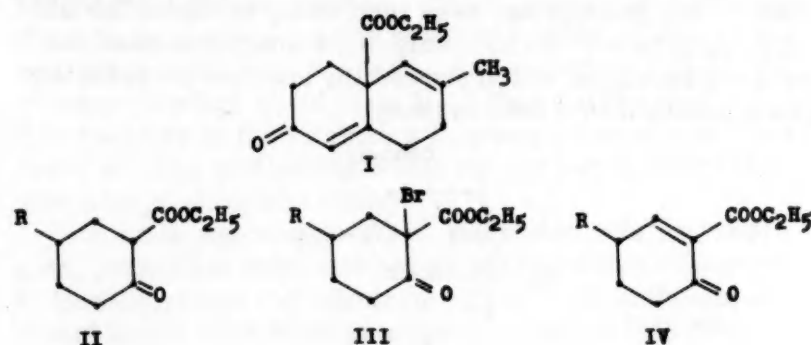
PRELIMINARY STUDIES TOWARD THE SYNTHESIS OF 18-OXYGENATED STEROIDS

(L. C. Card No. Mic 60-1167)

Raymond Richard Wittekind, Ph.D.
Columbia University, 1959

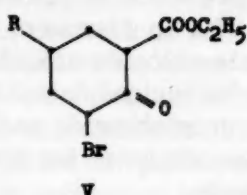
A review of the reported synthetic approaches to 18-oxygenated steroids is presented.

An efficient synthesis of 4a-ethoxycarbonyl-6-methyl-4,4a,7,8-tetrahydro-2[3H]naphthalenone (I), a potential intermediate for the elaboration of 18-oxygenated steroids, was desired. Ethyl 3-methylcyclohexen-6-one-1-carboxylate (IV, $\text{R} = \text{CH}_3$) was chosen as the starting material since condensation with methylvinyl ketone would be expected to give I.



All attempts to prepare the model compound, ethyl cyclohexen-6-one-1-carboxylate (IV, $\text{R} = \text{H}$), by the previously reported bromination of 2-ethoxycarbonylcyclohexanone (II, $\text{R} = \text{H}$) and subsequent aniline or thermal dehydrobromination of the resulting 2-bromo-derivative III ($\text{R} = \text{H}$) were unsuccessful. In fact, the spectral

properties of the monobromo compound, previously assigned structure III ($R = H$), established its structure as 6-bromo-2-ethoxycarbonylcyclohexanone (V, $R = H$), identical with an authentic sample. Compound V ($R = H$) could not be dehydrobrominated to a characterizable product.



Bromination of II ($R = CH_3$) with *N*-bromosuccinimide, in an attempt to introduce a bromo group at the 2-position, also failed because unstable mixtures were obtained.

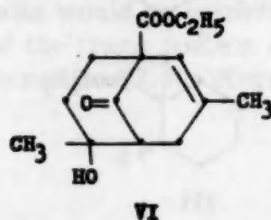
Treatment of II ($R = CH_3$) with sulfur chloride afforded 2-chloro-2-ethoxycarbonyl-4-methylcyclohexanone (VI) in high yield. Compound VI or its ethylenedioxy derivative could not be dehydrochlorinated by known methods.

Pyrolysis of the model compound, 2-acetoxy-2-methoxycarbonylcyclohexanone, prepared in low yield by the treatment of 2-methoxycarbonylcyclohexanone with lead tetraacetate, did not furnish the corresponding unsaturated β -ketoester.

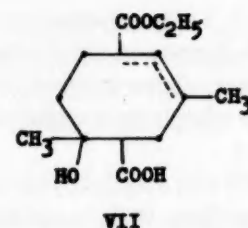
The synthesis of IV ($R = CH_3$) was achieved in high yield by the sodium hydride-catalyzed carbethoxylation of 4-methyl-3-cyclohexenone under well-defined conditions. The structure of the highly enolic material, so obtained, was proved by its elemental analysis and that of its 2,4-dinitrophenylhydrazone, its infrared and ultraviolet spectral properties, catalytic hydrogenation of its ethylenedioxy derivative to II ($R = CH_3$), after acid hydrolysis, dehydrogenation to ethyl 2,5-cresotate and methylation followed by acid hydrolysis and decarboxylation to 2,4-dimethyl-2-cyclohexenone.

The infrared, ultraviolet and nuclear magnetic resonance spectra of ethyl 2-ethylideneacetoacetate and the infrared and ultraviolet spectra of ethyl 2-isobutylideneacetoacetate, both acyclic analogs of IV ($R = CH_3$), were determined. The nmr spectrum of the former confirmed its structure and its anomalous ultraviolet spectrum was explained by assuming an *s-cis* conformation of the double bond and the ketone group.

Condensation of IV ($R = CH_3$) with methylvinyl ketone in the presence of methanolic choline afforded a viscous aldol. This product has been tentatively assigned the bicyclo structure VI on the basis of its analytical data and infrared spectrum which showed the absence of methylene group adjacent to a keto carbonyl.



Treatment of VI with ethanolic sodium ethoxide gave a 29.4% yield of I and a 23.2% yield of a carboxylic acid which has been assigned the eight-membered ring structure VII. Evidence in support of this structure consisted of its elemental and functional group analysis, spectral properties and a plausible mechanism for its formation.



A synthesis of 4-methylenecyclohexanone from 4-benzoyloxycyclohexanone was developed.

Microfilm \$2.50; Xerox \$6.00. 124 pages.

CHEMISTRY, PHARMACEUTICAL

PART I: A REINVESTIGATION OF SOME CONSTITUENTS OF PIPER METHYSTICIN.

PART II: A STUDY OF SUBSTITUTION REACTIONS OF IMIDAZOLES FOR PREPARATION OF ANALOGUES OF HISTIDINE TO BE USED IN LEUKEMIA STUDIES.

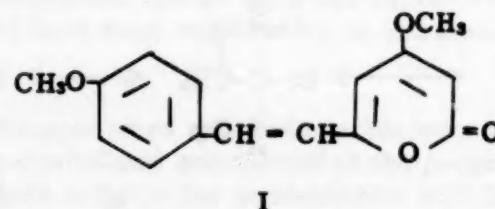
(L. C. Card No. Mic 60-984)

Donald Henry Canham, Ph.D.
University of Wisconsin, 1960

Supervisor: Associate Professor Edward E. Smissman

PART I

Yangonine which has been previously accepted as a 2-methoxy-4-pyrone was isolated and its infrared spectra obtained. This spectra contained a 5.8 μ carbonyl band which is normal for an unsaturated lactone carbonyl whereas the 4-pyrones absorb at 6.0 μ which is normal for ethylenic ketones. The absorption band was similar to the corresponding band from kavain and methysticin. This work established the structure of yangonine as the 4-methoxy-2-pyrone, I, and corroborated the results of two recent publications.



Dihydrokavain was found to be the only constituent of *Piper methysticin* to produce pronounced anesthesia on mucous membranes. Further pharmacological studies on dihydrokavain using mice revealed many discrepancies with other workers. Intraperitoneal injections of an aqueous Tween^R solution rapidly produced flaccid paralysis followed by unconsciousness which lasted for ten to fifteen minutes with complete recovery within twenty minutes after the injection.

PART II

Recent studies on amino acid concentrations of the blood of leukemic patients has demonstrated increased levels of glutamic acid. Since histidine has been shown to be the major precursor of glutamic acid, it has been postulated that the leukemic cells are causing an increased metabolism of histidine in order to utilize the carbon atom in the 2-position for formation of nucleic acids. The purpose of this work was to investigate methods of preparing 2-substituted imidazoles applicable to preparing 2-substituted histidines which might prove beneficial in leukemia as an antimetabolite.

Several reactions at the 2-position of imidazoles were studied in an attempt to produce a histidine analogue. Iodination is one of the few reactions which proceeds to give a 2-substituted imidazole. Iodination of histidine yields a moniodo compound which had been referred to as 2(or 4)-iodohistidine. By displacement with thiourea this moniodohistidine was converted to the known 2-mercapto-histidine, which established the iodo compound as 2-iodo-histidine.

When displacement of the iodine was attempted with various fluorides the products could not be isolated. This failure to isolate any product was a result of the salt-like character of the amino acid and its amphoteric properties.

Work was then directed to fluoride displacement in the simpler system of 2-iodo-4(or 5)-methylimidazole. Attempted displacement with potassium fluoride, antimony trifluoride, and argentous fluoride resulted in recovery of starting material, while base catalyzed displacement with potassium fluoride resulted in isolation of 2,4(or 5)-diiodo-5(or 4)-methylimidazole. Acid catalyzed displacement either with the mineral acid salt of 2-iodo-4(or 5)-methylimidazole and potassium fluoride, or with concentrated hydrofluoric acid resulted in replacement of iodine by hydrogen.

This replacement of iodine by hydrogen was thought to be a result of the low electronegativity of iodine. Bromine had been reported to substitute in the 2-position only after it had reacted in the unsubstituted 4(and/or 5)-position(s). When the dry silver salt of 4(or 5)-methylimidazole was brominated in a non-polar solvent, some 2-bromo-4(or 5)-methylimidazole was formed. Although this reaction seemed a promising path to a 2-fluoroimidazole, displacement of 2-bromo-4(or 5)-methylimidazole with fluoride was not attempted.

To obtain a 2-fluoroimidazole by a Schiemann type reaction the 2-amino imidazole was necessary. The existing method for preparation of 2-amino-4(or 5)-methylimidazole is difficult and results in poor yields. Displacement of the 2-iodo-4(or 5)-methylimidazole with sodium amide in liquid ammonia resulted in formation of some 2-amino-4(or 5)-methylimidazole which was isolated as the picrate. A Schiemann reaction was not attempted on this compound because insufficient quantities of it resulted from this reaction.

Microfilm \$2.50; Xerox \$3.60. 63 pages.

THE COMPLEXING TENDENCIES
OF CYANOCOBALAMIN WITH
INORGANIC COMPOUNDS

(L. C. Card No. Mic 60-997)

Ruth Naomi Havemeyer, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Takeru Higuchi

It was the aim of this study to investigate possible insoluble or slowly soluble adducts of vitamin B-12 which might act as depots for its slow release in the body and to obtain some information as to possible sites of complexing, by inorganic reagents, on this macromolecule.

The method of studying the interactions between the inorganic compounds and vitamin B-12 was based on phase solubility analysis at $25^{\circ} \pm 0.05^{\circ}\text{C}$. The samples were assayed for B-12 content spectrophotometrically.

The inorganic compounds investigated as possible complexing agents were:

- heteromolybdates - sodium, nickel, and manganese salts of phospho-12-molybdic acid, sodium-2-phospho-18-molybdate, sodium-silico-12-molybdate, phosphotungstic acid, phosphomolybdic acid
- transition metal salts - chlorides of platinum, gold, palladium, mercury, lead, cobalt, nickel, cadmium, manganese, copper, zinc, iron, barium, sodium, lithium, aluminum, and ammonium chloride and hexammino-cobalt chloride
- miscellaneous reagents - Reinecke salt, potassium mercuric iodide, chromium potassium sulfate, zirconium sulfate, ferrous sulfate, ferric sulfate, potassium ferricyanide, potassium ferrocyanide, oxalic acid, boric acid

Of the first named group of compounds sodium-silico-12-molybdate and sodium-2-phospho-18 molybdate increased the solubility of the vitamin B-12 but did not yield separate, isolatable complexes. The remaining heteromolybdate salts, phosphotungstic acid, and phosphomolybdic acid yielded solid complexes with the vitamin. They interacted with the cyanocobalamin so strongly that all of the B-12 was essentially removed from the system in the presence of excess reagent. The slopes of the initial portions of the curves and the relative lengths of the plateau regions indicate that the nickel and manganese salts had a stronger binding effect upon B-12 than did the sodium salt. The complex of the vitamin with phosphotungstic acid was more soluble, and perhaps less tightly bound, than that with phosphomolybdic acid.

Insoluble reaction products were also obtained with gold, potassium gold, and palladium chlorides. However, in these systems the spectrum of the B-12 in the supernatant liquid underwent progressive change with time. A pH-dependence study, using hydrochloric acid, showed that hydrogen ion concentration was not responsible for the change.

Platinum chloride formed an insoluble complex with the vitamin unaccompanied by spectral changes. Mercuric chloride decreased the solubility of the B-12; the absence of an increased solubilization subsequent to the downslope led to the conclusion that this was not a true interaction

between the compounds, but rather only a medium effect upon the spectrum.

Of the miscellaneous compounds investigated, only potassium ferrocyanide interacted to decrease the solubility of the B-12. Since iron is present in the +2 state in this complex ion, a comparison study was made of the effects of ferrous and ferric sulfates on cyanocobalamin. The ferric salt increased the solubility of the vitamin by 35%, whereas the ferrous salt increased it by only 5%.

All of the remaining inorganic salts used in this investigation caused an increase in the solubility of cyanocobalamin. The possible value of these compounds for increasing the absorption and/or stability of vitamin B-12 should not be overlooked.

This work included an additional study on the effects of several of the complexing agents upon benzimidazole, a moiety of the B-12 molecule. Platinic chloride and three of the heteromolybdates formed insoluble complexes with benzimidazole, whereas ferric chloride and cobalt chloride caused a great increase in the solubility of this compound.

A similar study was undertaken with acetamide, another B-12 moiety. However, this investigation could not be completed because the great solubility of this amide caused a large volume change in the system.

Microfilm \$2.50; Xerox \$4.40. 83 pages.

CHEMISTRY, PHYSICAL

AN IN SITU METHOD FOR ALTERATION OF CATALYTIC ACTIVITY BY GENERATION OF A REACTANT ON THE SURFACE OF THE CATALYST

(L. C. Card No. Mic 59-6980)

Clyde Dunn Alley, Ph.D.
The University of Tennessee, 1959

Major Professor: M. J. Joncich

Two methods of generating reactants on a catalytic surface were used to investigate the effect of this procedure on the activity of the platinum and palladium catalysts.

In the first method the effect of electrolytic polarization on the catalytic activity of platinized and smooth platinum electrodes was measured in the hydrogenations of allyl alcohol and oxygen in solution. The catalysts were subjected to both direct and alternating polarization in acid, basic and neutral solutions. A reaction system was constructed such that the hydrogenations could be studied for unlimited lengths of time. It was completely automatic, and very slow reactions could be followed. The potentials of the electrode catalysts were also measured with respect to a reference electrode.

The catalytic activity of the platinum electrodes were observed to be enhanced in both reactions by the following means: 1. alternating polarization; 2. changing the polarity of the catalysts suddenly; and 3. stopping anodic polarization of a platinized-platinum catalyst. This increased activity was not observed in basic solutions. In

the case of the hydrogen-oxygen reaction, periodic behavior of the catalytic activity and the potential of the anode was observed for anodic polarization of smooth platinum electrodes in acid solutions.

In the other method hydrogen was caused to diffuse electrolytically through a palladium thimble, the inside of which was used as a catalyst for low pressure hydrogenation reactions. Untreated and hydrogen pretreated palladium thimbles were also studied as catalysts for the hydrogenation of ethylene, acetylene and oxygen. The diffusion rate of hydrogen through the palladium was studied as a function of the temperature, current density and the pressure of the reactant gases on the inside surface.

The permeation rate of hydrogen was found to be proportional to the current density at low currents. The presence of ethylene, acetylene and oxygen on the inside surface of the metal lowered the rate of diffusion. This effect was correlated with the heats of chemisorption of the gases on palladium.

The activity of the palladium through which hydrogen was diffusing was observed to be higher than that of pure palladium, which, in turn, was higher than that of beta palladium for the hydrogenation of ethylene and acetylene. The hydrogenation of ethylene on palladium through which hydrogen was diffusing was found to be first order with ethylene pressure and zero order with hydrogen pressure. The order was reversed on beta palladium. It was proposed that ethylene in the gas phase reacts with active hydrogen which emerges from the catalytic surface due to diffusion.

In the case of the hydrogen-oxygen reaction, a palladium surface with hydrogen diffusing through it was found to be less active than a pure palladium surface. Oxygen adsorbed on the surface was believed to react with hydrogen in the gas phase on the former type of catalyst.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

THE TRANSFERENCE NUMBERS OF POTASSIUM AND CHLORIDE IONS IN FORMAMIDE AT 25° C.

(L. C. Card No. Mic 60-631)

Carl Berger, Ph.D.
University of Kentucky, 1952

EXPERIMENTAL

The purification of formamide has been accomplished by distillation under reduced pressure.¹ It was found that a number of fractional crystallizations (usually three) consistently yielded formamide of desired purity. The purity needed for the experimental work has material in the $n \times 10^{-5}$ ohms⁻¹ conductance range (where n is an integer).

The Hittorf cell was designed and constructed using the apparatus of MacInnes and Dole² as a model. The form of electrodes used by the above investigators proved to be quite satisfactory for the experimental procedures in formamide solutions of potassium chloride. It was found that the Khotinsky cement usually used to seal electrodes into place was not satisfactory since it dissolved partially in formamide. After some investigation it was found that Plcene was inert with respect to formamide and it was

utilized thereafter for all sealing operations. Conventional coulometers^{3,4} proved sufficiently accurate for our work. The experimental technique used in our transference experiments was similar to the procedure used by MacInnes and Dole.⁵ The potassium chloride used was a product that had been recrystallized several times by the manufacturer in preparation for use for accurate pH work. Finally, all samples were analyzed for chloride utilizing the Fisher titrimeter.

RESULTS

The experimental transference data obtained are summarized in Table I.

TABLE I.

The Transference Numbers of Potassium and Chloride Ions in Formamide.

Normality	t^+	t^-
0.1775	0.40	0.60
0.1842	0.40	0.60
0.2158	0.40	0.60
0.2566	0.39	0.61
0.5073	0.38	0.62
0.5217	0.38	0.62
0.6353	0.41	0.59

DISCUSSION

During the experimentation much anomalous behavior arose during the analysis of chloride in formamide using the Fisher titrimeter. It was found that this behavior was caused by high volume fractions of formamide and high concentrations of potassium chloride therein. These experimental difficulties were circumvented by the construction of a modified salt bridge utilizing a formamide-potassium sulfate bridge instead of the aqueous form usually employed in chloride analyses. In actual practice, the above errors were avoided by considerable dilution of the samples to be analyzed.

The variation of the transference number of potassium ion in formamide has been found to be an exponential function of the concentration.

$$t^+ = 0.40_e e^{-\frac{c}{10}} \quad (1)$$

where t^+ = transference number of the cation

c = concentration in equivalents per liter

Using this relationship it has been possible to calculate the limiting transference number of potassium and chloride ions in formamide. If c is allowed to approach zero, the t will approach 0.40_e as a limit. This value can be used as the basis for calculating the ionic conductances of potassium and chloride ions in formamide. Moreover, if we consider the Kohlrausch relationship to be valid in formamide, then a large number of individual ionic conductances in the solvent can be calculated on a theoretical basis. If these values are valid, then it follows that a number of physical properties such as transference numbers, ionic mobilities, and diffusion coefficients may be calculated. The absolute solvation of the potassium ion in formamide

has been calculated by Stokes' Law and apparently is much greater in formamide than in water. An empirical relation was devised linking the cation transference number in a number of solvents:

$$t^+ = \frac{0.53}{(D \cdot 107)^{\frac{1}{2}} \cdot \left(\frac{S^-}{S^+}\right)^{\frac{1}{4}}} \quad (2)$$

where t^+ = cation transference number

$\left(\frac{S^-}{S^+}\right)$ = ratio of the degree of solvation of anion

0.53 = constant

η = viscosity in poises

Calculated results obtained using equation (2) give further evidence that the relative degrees of solvation of the ion in formamide and in water indicated by Stokes' Law are substantially correct.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

1. Newell, T. M., *op. cit.*
2. MacInnes, D. A. and Dole, M., *op. cit.*
3. Richards, T. W. and Anderegg, F. O., *J. Am. Chem. Soc.*, **27**, 7-23, (1915).
4. Rosa, E. B. and Vinal, G. W., *J. Research Nat. Bur. Standards*, **9**, 151-207, (1938).
5. MacInnes, D. A. and Dole, M., *op. cit.*

THE KINETICS AND MECHANISMS OF THE THERMAL EXCHANGE OF IODINE WITH ALKYL IODIDES USING I^{131}

(L. C. Card No. Mic 60-1133)

John Edward Bujake, Jr., Ph.D.
Columbia University, 1959

The kinetics and mechanisms of the liquid phase thermal exchange of iodine with methyl, n-propyl, isopropyl, neopentyl, and t-butyl iodide have been studied using radioactive iodine¹³¹. The primary and secondary iodides appear to exchange with iodine from 130 to 200° mainly by means of a free radical mechanism, with the dominant term in the rate expression being first order in alkyl iodide and half order in iodine. Two propagation mechanisms, direct substitution and abstraction, have been proposed. Substitution involves a backside attack on the alkyl iodide by an iodine atom to give the exchanged iodide. In the kinetically-similar abstraction mechanism, an iodine atom abstracts iodine from the iodide to give an alkyl radical which, in turn, reacts with an iodine molecule to bring about the exchange. Attempts have been made to determine which of the two mechanisms predominates by using oxygen which has been shown to react with alkyl radicals and, hence, might inhibit the abstraction step. However, the rate of exchange was inhibited in the presence of oxygen to an extent which would tend to lessen the importance of the abstraction mechanism and indicate that at least part of the exchange was taking place by substitution.

The Arrhenius activation energies were of the order of 30 Kcal/mol and increased slightly with increasing RI

bond strength. Light accelerated the exchange reaction, and no appreciable solvent effects were observed.

The kinetics of the exchange of iodine with *t*-butyl iodide, studied from 0 to 60°, suggest that this reaction is taking place by means of a molecular mechanism with two iodine molecules in the transition state. Increasing the polarity of the solvent produced a large increase in the exchange rate, which would favor a rather polar ion pair transition state. An activation energy of 9.6 Kcal/mol was obtained in hexachlorobutadiene. No photochemical effects were observed.

There were no indications of heterogeneity or that any appreciable isomerization or other chemical reactions, except a slight iodide decomposition, were occurring in the alkyl iodide-iodine exchanges.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

CORRELATIONS OF SCINTILLATION EFFICIENCY WITH MOLECULAR STRUCTURE

(L. C. Card No. Mic 60-1033)

Jesse Marvin Cleveland, Jr., Ph.D.
University of Colorado, 1959

Supervisor: Associate Professor Raymond N. Keller

Quantitative pulse height data were obtained for a number of benzoic acid derivatives and their salts in dioxane-water-naphthalene solution. The types of compounds investigated were as follows:

Benzoic acid	All isomers of trihydroxybenzoic acid
Salicylic acid	4 and 5-Aminosalicylic acids
3,4, and 5-Alkylsalicylic acids	Thio- and mercaptosalicylic acids
3 and 5-Phenylsalicylic acids	2 and 4-Hydroxyisophthalic acids
3,4, and 5-Methoxysalicylic acids	2,3-Dihydroxy-1,4-phthalic acid
3,4, and 5-Fluorosalicylic acids	Anthranilic acid
3,4, and 5-Chlorosalicylic acids	3-Hydroxyanthranilic acid
3,4, and 5-Bromosalicylic acids	5-Chloro and 3,5-dichloroanthranilic acids
4 and 5-Iodosalicylic acids	N-Methyl and N-phenylanthranilic acids
3,4,5, and 6-Hydroxysalicylic acids	N,N-Dimethylantranilic acid
m-Aminobenzoic acid	Anthranilamide
m(N,N-Dimethylamino)benzoic acid	Salicylanilide

3,4- and 3,5-Diaminobenzoic acids	Methyl and phenyl salicylates
3-Aminophthalic acid	Methyl and ethyl anthranilates
5-Aminoisophthalic acid	o-Alkoxybenzoic acids
Salicylaldehyde	o-Halobenzoic acids
Salicylamide	Phthalic acids
	Di- and tricarboxybenzoic acids

Also tested were numerous miscellaneous benzoic acid derivatives.

In addition to the benzoic acid derivatives, the following types of compounds (and their salts) were screened for scintillation activity:

Benzene derivatives	Non-benzenoid aromatic systems
Furan derivatives	Unsaturated straight-chain compounds
Pyridine derivatives	Miscellaneous fluorescent compounds
Naphthalenesulfonic acids	

All of the latter failed to scintillate.

Pulse heights were obtained by placing a solution of the compound in the solvent (9.09 per cent water in dioxane containing fifty grams per liter of naphthalene) and placing this solution on the open window of a photomultiplier tube. The light emitted when the solution is excited by electrons from cesium-137 is detected by the phototube, whose output is amplified and fed to an oscilloscope, where the pulses displayed on the screen are photographed. Measurement of the maximum displacement from the reference line gives the pulse height. Most compounds were studied at several different concentrations, so that the variation of pulse height with concentration could be determined.

The results indicate that among the derivatives of benzoic acid, a strong electron donor, such as amino or hydroxyl, must be ortho to the carboxyl group for scintillation to occur. The only exceptions to this generalization are *m*-aminobenzoic acid and its *N,N*-dimethyl derivative.

Among the *o*-hydroxybenzoic acid derivatives, only the salts scintillate, while in the case of the aminobenzoic acids the acids themselves exhibit stronger scintillation activity than their salts. It appears that the acid anion is the species responsible for scintillation. The anion of hydroxybenzoic acids is present to an appreciable extent only in solutions of their salts, but aminobenzoic acids may provide the necessary anion concentration by zwitterion formation.

Apparently the ability to scintillate is largely dependent on the resonance, or electron delocalization, within the molecule; and the effect of a substituent is dependent upon both its electronic properties and the position of substitution. Among the substituted salicylates, an ortho-para-directing group, such as fluoro, chloro, hydroxy, methoxy, in the 3- or 5- position causes an enhancement of scintillation, while such groups in the 4- or 6- position greatly repress light emission. Electron-attracting (meta-directing) groups such as sulfonate, formyl, and carboxyl, in the

3- or 5- position cause a reduction in scintillation activity. Substitution of more than one group on anthranilic acid or salicylic acid salts invariably lowers scintillation efficiency.

Pulse height studies with mixed solutes and with solvents containing various quantities of the three components (dioxane, water, and naphthalene) suggest that the shapes of concentration versus pulse height curves are dependent on solvent as well as solute, and that there is only a very limited amount of energy available to excite the solute. The mixed solute study made it possible to investigate quenching effects in greater detail.

Microfilm \$2.50; Xerox \$6.40. 133 pages.

OXIDATION OF METHYL RADICALS

(L. C. Card No. Mic 60-1176)

David Francis Dever, Ph.D.
The Ohio State University, 1959

The vapor phase photolysis of azomethane at low pressures was studied in the presence of O_2 . Both infrared and ultraviolet analytical techniques were used. Although data of merely a qualitative nature were obtained from the UV studies, these suggested the presence of O_3 , and proved the presence of formic acid and formaldehyde as products.

The long-path (20 meter) IR spectrometer gave kinetic data and indirect evidence of the existence of O_3 as an intermediate in the reaction.

It is suggested that the primary process in azomethane photolysis is $(CH_3)_2N_2 + h\nu \rightarrow 2CH_3 + N_2$, and is followed by $CH_3 + O_2 \rightarrow CH_3O_2$, $CH_3O_2 + O_2 \rightarrow CH_3O + O_3$, $2CH_3O \rightarrow CH_3OH + H_2CO$. A small amount of formic acid is formed, presumably from another reaction involving H_2CO . NO H_2O , CO, or CO_2 was detected.

The results indicate an unexpectedly high rate constant for the CH_3O disproportionation reaction. A simple model involving dipole interactions of CH_3O radicals is suggested to explain the data.

Microfilm \$2.50; Xerox \$3.00. 46 pages.

A CONDUCTIMETRIC STUDY OF DILUTE SOLUTIONS OF MAGNESIUM, ZINC, AND CADMIUM CHLORIDES IN ETHANOL OVER THE TEMPERATURE RANGE $-70^\circ C.$ TO $20^\circ C.$ AND OF DILUTE SOLUTIONS OF MAGNESIUM, ZINC, AND CADMIUM BROMIDES AND IODIDES IN ETHANOL AT $20^\circ C.$

(L. C. Card No. Mic 60-1223)

Michael Golben, Ph.D.
University of Kentucky, 1949

There have been a few efforts to interpret the conductance data for moderately strong polyvalent electrolytes in aqueous and in some non-aqueous solutions according to present theory, but, to our knowledge, no similar work has been done with solutions of polyvalent electrolytes in

ethanol. In this research measurements were made of the conductances of dilute solutions of magnesium, zinc, and cadmium chlorides in ethanol over a temperature range from -70° to $20^\circ C.$, and of magnesium, zinc, and cadmium bromides and iodides at $20^\circ C.$

Values for the limiting equivalent conductance of the magnesium halides as extrapolated from the Kohlrausch plots indicated that a second ionization took place in dilute solution. When it was assumed that both ionization steps took place simultaneously, and the results were plotted according to an expression based on this assumption, a slightly curved line was obtained where a linear relationship had been expected. Upon assuming the first ionization to be complete in a definite concentration range, a plot of the equation that was derived from the mass law for this condition yielded the expected linear relationship.

$$\frac{1}{\Lambda} = \frac{1}{\Lambda_0} + \frac{1}{K\Lambda_0^2} \cdot c(\Lambda'_0 + \Lambda') \quad (1)$$

Here Λ' and Λ'_0 are the equivalent conductance and limiting equivalent conductance, respectively, of the ions produced by the second ionization. These are related to the measured conductance Λ and Λ_0 through a knowledge or estimate of transference numbers and the relative mobility of the intermediate ion. The equation can be solved for Λ_0 by reiterated approximations and extrapolations.

To correct equation (1) for interionic effects, use was made of the Shedlovsky function, F , and the Debye-Huckel activity coefficient, f_{\pm} , with result:

$$F\Lambda^* = \Lambda_0 - \frac{1.5}{K\Lambda_0} \cdot cf_{Mg^{++}} [(\Lambda^*F)^2 - .1111\Lambda_0^2] \quad (2)$$

Λ^* is a parameter that facilitates the application of the function F , and is related to the ionic strength of the solution. A plot of $F\Lambda^*$ as a function of $cf_{Mg^{++}} [(\Lambda^*F)^2 - .1111\Lambda_0^2]$ resulted in straight lines for the magnesium halides, indicating that the assumptions which were made in the derivation of equation (2) are reasonably valid.

With lower temperatures (from 20° to $-70^\circ C.$), $MgCl_2$ became a stronger electrolyte. This was indicated in several ways: (1) the thermodynamic dissociation constant increased, (2) the degrees of dissociation at comparable concentrations increased, and (3) the actual slopes of the Kohlrausch plots approached the theoretical Onsager slopes. The dissociation of the magnesium halides at $20^\circ C.$ increased in the order chloride - bromide - iodide. Correction for interionic attraction amounted to less than 0.3% at $20^\circ C.$ for $MgCl_2$.

The Kohlrausch square root curves and the mass law curves for the zinc halides showed that the zinc salts in ethanol solution dissociate to a very small extent only.

Solutions of $CdCl_2$, exhibited the characteristics of a uni-univalent electrolyte even at $-70^\circ C.$ The Shedlovsky method was applied satisfactorily. As with $MgCl_2$, the degree of dissociation and thermodynamic dissociation constant increased with lower temperatures. Dissociation decreased in the order chloride - bromide - iodide, which is the reverse of the order observed for the magnesium and zinc halides. To explain this behavior, it is suggested that cadmium has a much greater tendency to form complex ions than have magnesium and zinc. Numerous recent papers support the view that complexes of cadmium exist in aqueous solution. Complex formation is even more

probable in ethanol. The suggestion is offered that coordination of the cadmium and iodide ions occurs with the formation of the tetrahedral CdI_4^- ion, largely as a result of the strongly positive nature of the cadmium ion with its vacant 4f shell, and the basic tendencies and easy deformability of the iodide ion. The bromide and chloride are assumed to be affected to a lesser extent.

As a result of this research, it is concluded that solutions of magnesium, zinc, and cadmium halides in ethanol solution exhibit individual and specific characteristics.

Satisfactory explanations of their behavior probably would involve consideration of individual ionic properties and the ion-ion and ion-solvent energy relationships.

Microfilm \$2.50; Xerox \$8.00. 172 pages.

REACTIONS OF IODINE EXCITED BY 1849Å RADIATION WITH HYDROGEN AND HYDROCARBONS

(L. C. Card No. Mic 60-993)

Thomas Allen Gover, Ph.D.

The University of Wisconsin, 1960

Supervisor: Professor John E. Willard

This work was undertaken to obtain information concerning the reactions with hydrogen and simple hydrocarbons of the excited iodine molecule which is produced when iodine absorbs 1849Å radiation. The rates of reaction were studied as a function of temperature and the pressure of the reactant gases. Using absorptometry and gas chromatography in conjunction with iodine-131 and carbon-14 labeling, the products of the reaction with methane were identified. In addition to equimolar amounts of methyl iodide and hydrogen iodide, much smaller amounts of methylene, ethyl, n-propyl, iso-propyl, n-butyl and sec-butyl iodides and C_2 and C_3 hydrocarbons were also found. Based on a quantum yield of unity for exchange between iodine and methyl iodide for 1849Å radiation absorbed by methyl iodide, the quantum yield for methyl iodide and hydrogen iodide production was 0.05. The yield for the other iodides was lower by a factor of about 300.

The rates of reaction of iodine with hydrogen, methane and ethane increased with pressure and approached a maximum rate asymptotically. The maximum quantum yields, based on a quantum yield of unity for exchange between iodine and methyl iodide at 1849Å, were 0.03 in hydrogen, 0.05 in methane and 0.07 in ethane. In ethylene and in n-butane the yields were about the same as in ethane. The yields seemed to depend on an excited iodine molecule with a mean lifetime of about 10^{-8} seconds. Quenching cross sections in methane and ethane appeared to be about 100Å^2 . The possibility that the reactions observed are due to triplet states is discussed. Methyl iodide was produced in the methane-iodine system in the presence of oxygen, suggesting that a thermal radical is not involved in its production.

The molar absorptivity indexes for 1849Å radiation were determined for iodine and some of the product alkyl iodides in order to estimate the importance of reactions due to radiation absorbed by products. The unfiltered radiation from the mercury arc and a platinum cathode

phototube sensitive only to radiation of 2000Å or below were used. The alkyl iodides appeared to follow Beer's Law but the molar absorptivity index of iodine increased with the pressure of added inert gas. At 600 mm of argon the molar absorptivity index of iodine was 2×10^5 .

On the basis of some experiments with monochromatic 1860Å radiation, whose intensity was established with a calibrated thermopile, the quantum yield for exchange at 1849Å appeared to be significantly higher than the value of unity assumed in this work.

Microfilm \$2.50; Xerox \$6.60. 137 pages.

THE BOLTZMANN EQUATION IN NON-EQUILIBRIUM STATISTICAL MECHANICS

(L. C. Card No. Mic 60-1000)

Henry Boughton Hollinger, Ph.D.

The University of Wisconsin, 1960

Supervisor: Associate Professor Charles F. Curtiss

The extension of the dilute-gas Boltzmann equation to higher order in the density is considered from the point of view of ensemble theory. The Liouville equation is modified by the introduction of the Stosszahlansatz assumption, and a Boltzmann equation is determined explicitly to the binary and ternary collision approximations.

The Stosszahlansatz, as it was used by Boltzmann in his derivation of the dilute-gas Boltzmann equation, is the assumption that the velocities of two particles which are about to collide are not correlated. This assumption was used by Born and Green to obtain the Boltzmann equation from the Liouville equation; as was used by Born and Green the Stosszahlansatz is the assumption that the two-particle distribution function factors into a product of one-particle distribution functions on the part of the two-particle phase where momenta are pre-collision momenta. In the present paper, this assumption is used in a similar way to express the s-particle distribution function as a product of one-particle distribution functions on the part of the s-particle phase space where all momenta are pre-collision momenta. It is shown that this assumption leads to a ternary collision approximation which agrees with the results obtained by Uhlenbeck and Choh from the Bogolyubov proposals.

The rigid-sphere gas is considered, and it is shown that the Stosszahlansatz in this case leads to the Boltzmann equation for dense gases proposed by Enskog. It is shown for this model that triple and higher collisions do not contribute to the time rate of change of the distribution functions.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

AN INVESTIGATION OF THE VOLUMETRIC BEHAVIOR OF VAPORS AT LOW PRESSURES

(L. C. Card No. Mic 60-1196)

Glenn Fred Leverett, Ph.D.
The Ohio State University, 1959

An experimental technique was developed which afforded a rapid and precise determination of the low pressure P-V-T properties of vapors. The over-all precision of the experimental vapor compressibility was better than six parts in ten thousand. The experimental technique was used to determine the low pressure P-V-T properties of n-pentane, n-hexane, n-heptane, cyclohexane, benzene, acetone, carbon disulfide and perfluoro methyl cyclohexane. The compressibilities were determined over a pressure range of 200 mm. Hg to 800 mm. Hg and a temperature range of 40 to 200 degrees centigrade. The resulting P-V-T data for all compounds were found to agree with a virial equation of state of the form

$$PV/RT = A_1 + A_2/V$$

where A_1 is the temperature-independent first virial coefficient and A_2 is the temperature-dependent second virial coefficient.

The concept of the Lennard-Jones potential was used to derive a number of relationships involving the group $\Delta E/\Delta\rho$, the ratio of the energy of vaporization to the change of density during vaporization. The group $\Delta E/\Delta\rho$ was found to be proportional to the product of the Lennard-Jones parameters b_0 and e , where b_0 is the collision volume and e is the minimum potential energy between a pair of molecules. The group $\Delta E/\Delta\rho$ was also found to be proportional to a particular grouping of the critical properties, T_c^2/P_c , which is proportional to one of Van der Waals' constants.

The relationship between $\Delta E/\Delta\rho$ and the group T_c^2/P_c was used to develop a reduced equation of state which was independent of the critical properties. The equation of state correlated all data of the present investigation. In addition, satisfactory correlations were obtained for compounds reported in the literature. Both polar and nonpolar compounds were included in the correlations. The correlations permit the prediction of the P-V-T behavior of real gases from properties which are generally available. The properties required are the vapor pressure curve, or latent heat of vaporization, and the density of the liquid.

Microfilm \$2.50; Xerox \$6.60. 138 pages.

THE CRYSTAL AND MOLECULAR STRUCTURE OF $C_8H_8AgNO_3$

(L. C. Card No. Mic 60-937)

Francis Scott Mathews, Ph.D.
University of Minnesota, 1959

Adviser: William N. Lipscomb

In the $C_8H_8AgNO_3$ complex, the Ag^+ ion interacts with two nonadjacent " π "-bonds of each cyclooctatetraene molecule at Ag^+ -C distances of 2.46, 2.51, 2.78, and 2.84 Å.

Slightly longer Ag^+ -C interactions, 3.17 and 3.29 Å, join these units into infinite chains along the c axis of the crystal. The short Ag^+ -O distances of 2.36 and 2.43 Å suggest some covalency. There are four $AgC_8H_8NO_3$ in a unit cell of symmetry $P2_1/a$ with parameters, $a = 16.84$, $b = 8.94$, $c = 5.86$ Å, and $\beta = 91^\circ 7'$. Agreement factors for the 1136 observed X-ray diffraction maxima are

$$R = \sum ||kF_o| - |F_c|| / \sum |kF_o| = 0.112 \text{ and}$$

$$r = \sum \omega [(kF_o)^2 - F_c^2]^2 / \sum \omega (kF_o)^4 = 0.056.$$

The $C_{16}H_{16}AgNO_3$ complex has been reinvestigated by Patterson superposition, Fourier, and least-squares methods. A model with 16 carbon atoms, a nitrogen atom, 9 oxygen atoms at 1/3 weight and a silver atom with anisotropic thermal parameters gives agreement factors of $R = 0.204$ and $r = 0.131$. Five abnormally long C-C distances, greater than 1.72 Å, cast doubt on the quality of the 525 observed structure factors.

Microfilm \$2.50; Xerox \$4.20. 76 pages.

THE EFFECT OF WAVELENGTH ON THE QUANTUM YIELDS FOR IODINE DISSOCIATION

(L. C. Card No. Mic 60-1151)

Lenore Fay Meadows, Ph.D.
Columbia University, 1959

The quantum yields for iodine dissociation at 25°C. as a function of the frequency of absorbed light have been determined in an attempt to gain some insight into how the intimate behavior of atoms in solution depends on their kinetic energies. In the cases investigated the energy in excess of that required to dissociate iodine varied from 3.3 to 35 kcal./mole.

The data were obtained by measuring the rates of isotopic exchange between trans-diiodoethylene and radioactive iodine-131 in hexane or in hexachlorobutadiene-1,3. From these exchange rates, from the measured rate of light absorption by iodine, and from a knowledge of the trans-diiodoethylene concentration, it is possible to calculate relative quantum yields at two different wavelengths in a given solvent. The quantum yield at each wavelength could then be calculated using a previously determined value for the quantum yield at 436 mμ at the temperature and in the solvent of interest.

If a solution of iodine in a non-polar solvent is illuminated continuously with visible radiation, the iodine atoms thus formed will undergo a geminate recombination, or, failing this, will enter into exchange reactions with trans-diiodoethylene or with iodine. Since in such a dissociative process in solution the quantum yield, ϕ , applies to the production of those atoms which escape primary or secondary recombination, then $1 - \phi$ corresponds to that fraction of atoms which do not escape from their original partner in the parent molecule. A simple continuum model for the liquid state predicts that $\phi/(1-\phi)$ should be a linear function of the square root of the total excess kinetic energy of the separating atoms. Although our data fail to confirm this conclusion, they are consistent with a "cage" model for liquids.

Microfilm \$2.50; Xerox \$4.20. 79 pages.

THE CRYSTAL STRUCTURE OF SOME
CESIUM AND TETRAMETHYLAMMONIUM
HALIDE COMPLEXES OF COBALT,
COPPER, AND ZINC.

(L. C. Card No. Mic 60-864)

Bruno Morosin, Ph.D.
University of Washington, 1959

The crystal structures of cesium tetrachlorocuprate (II), cesium tetrabromozincate and -cuprate (II) and tetramethylammonium tetrachlorozincate, -cobaltate (II), and -cuprate (II) have been investigated and were found to be of the potassium sulfate type and to illustrate both the regular tetrahedral configuration and the Jahn-Teller distorted tetrahedral configuration. The stereochemistry of these various complexes is in accord with the elementary account of the Ligand Field Theory which has been presented.

Of significance are the 102.7° and 124.1° bond angles of the tetrachlorocuprate (II) ion and the 100.9° and 128.4° angles of the tetrabromocuprate (II) ion establishing structural evidence that bromide ions exhibit a greater ligand field effect than chloride ions.

Microfilm \$2.50; Xerox \$4.80. 95 pages.

THE ELECTRICAL CONDUCTANCE OF
SOME AQUEOUS ELECTROLYTES IN
THE VICINITY OF THE CRITICAL
TEMPERATURE OF WATER

(L. C. Card No. Mic 60-565)

David Petri Pearson, Ph.D.
University of Southern California, 1960

Chairman: Professor Copeland

Modifications of previously existing apparatus and techniques are described which permit the measurement of the electrical conductance of one phase of a two-phase system; and electrical conductances of water and aqueous solutions of sodium chloride, hydrochloric acid, and sodium hydroxide have been studied between 300° C. and 383° C. Solute compositions were in the range of 1-30 x 10⁻⁴ molal and densities were between 0.4 and 0.7 g/cc.

Calculations of liquid phase concentrations for two-phase systems are based on the assumptions that phase densities were the same as those for water and that all solute was in the liquid phase. Both assumptions appear valid where applied except for the acid at 300° C., where there is evidence of phase distribution. From the equivalent conductance-concentration data, limiting equivalent conductance values and dissociation constants are evaluated by Shedlovsky's method (*J. Franklin Institute*, 225: 739, 1938). Λ^0 values are between 1000 and 1550, and pK values range up to above 5. The present results agree with those of Noyes, et al. (*J. Am. Chem. Soc.*, 32: 159, 1910) and those of Fogo, Benson, and Copeland (*J. Chem. Phys.*, 22: 212, 1954) within experimental error.

Limiting equivalent conductances are depressed in the immediate vicinity of the critical point. This is consistent with the large negative apparent molal volume of sodium

chloride in this region found by Benson, Copeland, and Pearson (*J. Chem. Phys.*, 21: 2208, 1953), and is apparently due to the fact that ion-dipole interaction is (relatively) much stronger than the dipole-dipole interaction of the water. Interionic distances of closest approach calculated from ion association theory are 2.8 to 3.4 Å for the salt and 1.8 to 1.9 Å for the acid. The latter values suggest that covalent bonding plays a significant role in the association of hydrochloric acid. Because the α values are reasonably constant, however, a division of the dissociation constant into a constant for ionization and one for dissociation would have to be arbitrary. The excess mobility of hydrogenion over that of sodium ion is reasonably consistent with the theory of Gierer and Wirtz (*J. Phys. Chem.*, 56: 914, 1952). The conductance of sodium hydroxide calculated from this theory and based on the present values for the conductance of hydrochloric acid is higher than the present experimental values by 100 at 300° and 170 at 360° C. It is estimated that the effect of hydrolysis on the conductance of the sodium chloride solutions is within experimental error, as is the effect of triple ion formation on the conductances of all three electrolytes. Thermodynamic functions of dissociation are calculated for the salt and acid, which indicate that the free ions are much more strongly hydrated than are the associated species.

Hydrochloric acid solutions containing dissolved oxygen decomposed at high temperatures, as did all sodium hydroxide solutions. The latter evidently react to some extent with both the platinum cell body and the aluminum oxide insulator.

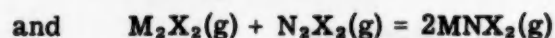
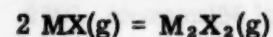
Microfilm \$2.50; Xerox \$5.40. 110 pages.

A MASS SPECTROMETRIC AND
THERMODYNAMIC STUDY OF GASEOUS
SPECIES IN THE VAPORIZATION OF ALKALI
METAL FLUORIDES AND HYDROXIDES FROM
PURE AND MIXED CONDENSED PHASES

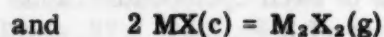
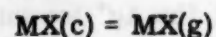
(L. C. Card No. Mic 60-885)

Richard Clinton Schoonmaker, Ph.D.
Cornell University, 1960

A mass spectrometer has been used to analyze the vapors effusing from a Knudsen type oven containing pure components, except LiOH, and mixtures of alkali fluorides and alkali hydroxides. In all cases with pure components, monomers and dimers are present in the equilibrium vapors. For all of the alkali fluorides gaseous trimers have been detected as a minor component of the vapors while in the case of the hydroxides only the trimer of NaOH has been found. With a mixed condensed phase, species characteristic of the pure components are present and in addition a mixed dimer, MNX₂(g), has been found. Thermochemical data are presented for the reactions

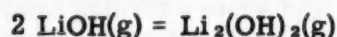


and in some cases



where M and N are constituent alkali metal cations and X is either a hydroxide or fluoride anion.

Further studies have been undertaken which involve the leakage of HCl(g) or $\text{H}_2\text{O(g)}$ at controlled flow rates into an effusion cell containing lithium oxide, sodium oxide or mixtures of the oxides with alkali halides. This investigation has provided additional information regarding the mechanisms of ion formation by electron impact on neutral gaseous species. Under the conditions employed in the leak studies with $\text{H}_2\text{O(g)}$ and $\text{Li}_2\text{O(s)}$, LiOH(g) has been detected. Data are reported for the reaction



From the results of studies with $\text{Li}_2\text{O(s)}-\text{HCl(g)}$, $\text{Li}_2\text{O-LiCl(c)}-\text{H}_2\text{O(g)}$, and $\text{Na}_2\text{O-NaF(c)}-\text{H}_2\text{O(g)}$ the existence of species containing mixed anions, $\text{Li}_2\text{(OH)Cl(g)}$ and $\text{Na}_2\text{(OH)F(g)}$, has been inferred.

The analogous behavior between the vaporization processes of alkali fluorides and hydroxides is discussed. Microfilm \$2.50; Xerox \$5.80. 120 pages.

SOME CRYSTAL STRUCTURE STUDIES:
PART I: THE CRYSTAL AND MOLECULAR
STRUCTURE OF PYRACENE.
PART II: THE CRYSTAL STRUCTURE OF
bis-(N-methylsalicylaldiminato) copper (II).

(L. C. Card No. Mic 60-872)

Gerald Lee Simmons, Ph.D.
 University of Washington, 1959

Chairman: Dr. E. C. Lingafelter

Part I.

The crystal and molecular structure of pyracene has been determined by x-ray diffraction techniques. The calculated bond lengths have estimated standard deviations of .03 Å. The calculated bond angles have an estimated standard deviation of 1°. The estimated standard deviations were obtained by the method of Cruickshank (1).

The bond lengths and angles of pyracene are compared with corresponding bond lengths and angles of naphthalene and acenaphthene. The aliphatic dimethylene bridge bond length is 1.59 Å. The planarity of pyracene is discussed.

Part II.

The cell dimensions and most probable space group of bis-(N-methylsalicylaldiminato) copper (II) have been determined.

Due to the low intensity of the x-ray tube available, only the more intense reflections were obtained. Only 70 out of 155 reflections of the $hk0$ data and 10 out of a possible 135 reflections of the hkl data were observed. Poor resolution of the structure resulted. A complete crystal structure study will be carried out, using the complete data. In addition, magnetic and optical studies are planned in this laboratory.

The features of the structure which could be ascertained were these: (1) the compound is trans-planar with

the ligand atoms about 1.9-2.0 Å from the copper atom, (2) the distance from the central copper atom to the two copper atoms filling out the octahedron is 3.33 Å with an estimated standard deviation of .01 Å as determined from cell dimension measurements and symmetry considerations. The crystal structures of nickel dimethylgloxime and bis-(N-methylsalicylaldiminato) copper (II) are compared. Microfilm \$2.50; Xerox \$3.00. 47 pages.

A STUDY OF UNPAIRED-ELECTRON
DENSITIES IN SEMIQUINONE FREE RADICALS

(L. C. Card No. Mic 60-1164)

Gershon Vincow, Ph.D.
 Columbia University, 1959

McConnell has proposed a relationship between the indirect proton hyperfine splittings in the electron spin resonance spectra of π -electron radicals and the unpaired spin density distributions. Unpaired spin densities calculated from McConnell's theory and the experimental splittings may be compared with unpaired spin densities calculated using simple valence theory.

The semiquinone ion free radicals are π -electron radicals containing oxygen hetero-atoms in the conjugated structure. One-electron molecular-orbital theory calculations of several semiquinones are performed. Two additional molecular-orbital theory parameters are introduced because of the presence of the oxygen atoms. The unpaired electron-density distributions obtained are compared to distributions calculated using McConnell's theory and the experimental proton hyperfine splittings.

The electron spin resonance spectra of a variety of semiquinones have previously been reported. The spectra of 1,4-naphthosemiquinone ion and 9,10-anthrasemiquinone ion have been fully resolved for the first time and careful measurement and interpretation made.

Ranges of values of the oxygen parameters, which result in the best agreement between predicted ratios of odd-electron densities and experimental ratios of splittings in 1,4-naphthosemiquinone ion and 9,10-anthrasemiquinone ion, are determined. Using these best ranges of oxygen parameters, the molecular orbital theory results for the four parasemiquinones studied (p-benzosemiquinone ion, 1,4-naphthosemiquinone ion, 9,10-anthrasemiquinone ion, and quinizarinsemiquinone ion) are in very good agreement with McConnell's theory.

Results for the two orthosemiquinones studied (o-benzosemiquinone ion and o-phenanthrenesemiquinone ion) and for a pyrogallolsemiquinone ion are not in agreement. Reasons for the disagreement are discussed.

Preliminary investigations of the extension of the present work to substituted semiquinones are made using the tolussemiquinone ion. Partial agreement between the results of McConnell's theory and the one-electron molecular orbital theory is obtained and possible explanations for the disagreement are discussed.

Microfilm \$2.50; Xerox \$5.40. 107 pages.

ECONOMICS

ECONOMICS, GENERAL

RACIAL DIFFERENCES IN CONSUMPTION AND AUTOMOBILE OWNERSHIP

(L. C. Card No. Mic 60-906)

Marcus Alexis, Ph.D.
University of Minnesota, 1959

American Negroes are reported to spend more than sixteen billion dollars a year for goods and services. It is known that the social and economic conditions confronting them are different than those experienced by White Americans. However, the extent to which these differences affect the market behavior of Negro consumers is not known. Since World War II there has been a mounting interest in the possible effect these social and economic differences may have on market behavior.

The purpose of this thesis is to: (1) indicate the historical interest in Negroes as consumers; (2) establish and test working hypotheses relating race and automobile ownership which are based on information in past economic and marketing studies of Negro and white consumer behavior and on sociological data; (3) use regression analysis to study the effect of selected economic and demographic variables which influence the value of automobiles owned in order to determine whether a "Negro Market" for automobiles exists.

If a Negro market for automobiles can be said to exist, Negro automobile owners must react differently to the economic and demographic variables facing them than do comparable whites. In order to determine if this is so, the results of observations of Negro consumers are compared with those obtained from comparable white consumers.

The comparisons of consumption patterns of Negroes and whites reveal that Negroes spend more for clothing and non-automobile transportation than do comparable whites, but less for food, housing, medical care and automobile transportation. The expenditure patterns for recreation and leisure and for home furnishings and equipment varies considerably from study to study and no general pattern emerges. Total consumption expenditures of Negroes are consistently less than for comparable whites.

Three stereotypes involving race and automobile ownership are also tested to determine if Negroes are more likely to: own more valuable automobiles; own automobiles in the medium and high price class; or, own automobiles which are purchased used. These stereotypes are tested by an application of the probability distribution of the binomial with $P=Q=.5$.

The net contribution of several variables to the value of automobiles owned is determined by multiple regression analysis. The analysis treats the value of automobiles owned as the dependent variable. The independent variables are: income, liquid assets, size of spending unit,

number of income receivers, age (of head of spending unit), home ownership, region, community, occupation, life cycle and race. Net regression coefficients are calculated for Negro and white spending units separately and for both groups combined with race as a dummy variable.

No evidence is found to support the three racial stereotypes about race and automobile value. None of the relationships are significant at the .05 confidence level.

Differences significant at the .05 confidence level are found in the net regression coefficients of four variables; age, age squared, community, and life cycle and the constant term. Race as a dummy variable does not have a significant net regression coefficient.

The community and life cycle variables have opposite effects on Negroes and whites. That is, whereas, the smaller the community the higher the automobile value for whites; it is just the opposite for Negroes. Also, value of automobiles for whites decreases as one gets further along in the life cycle. For Negroes the opposite relationship is found.

On the basis of the evidence in this study, it can be concluded that there are variables for which the reaction of Negro and white consumers differs, but that race itself is not a significant variable in automobile ownership.

Microfilm \$5.50; Xerox \$19.35. 430 pages.

LABOR MARKET EXPERIENCE OF A SAMPLE OF UNEMPLOYMENT BENEFIT EXHAUSTEES

(L. C. Card No. Mic 60-816)

Gene Stewart Booker, Ph.D.
Indiana University, 1959

The objectives of this study, conducted with the cooperation of the Indiana Employment Security Division, Research and Analysis Section were:

1. To establish evidence about the nature of the labor market experience and personal characteristics of Unemployment Insurance benefit exhaustees in Indiana during 1957. Such information should aid in estimation of the volume of unemployment and add to our understanding of the hypothesized peculiarities of this segment of the labor supply.
 2. To explore local Employment Security office information on claimant characteristics; to develop methods of assembling this information; and to relate these characteristics to labor market experience for a special group of benefit exhaustees.
 3. To evaluate the findings relative to the operation of the Unemployment Insurance system, problems of labor market analysis, and related questions of public policy.
- The method of analysis consisted of drawing three random samples: (a) equal to 25 per cent of all Indiana

exhaustees in the period April - September 1957, (n = 6,365), (b) 5 per cent of all intrastate claims in the first six months of 1957, and (c) the utilization of the female sample members from Marion County, some 470 women, as a subsample for an analysis of local office file content and assembly techniques. The subsample was also subjected to a more intensive analysis relative to labor market experience, made possible by the additional information obtained. The sources of data used were, State and local office files of the Indiana Employment Security Division, and the response to special questionnaires sent to the exhaustees. The questionnaire response rate was equal to 76 per cent of the sample. Extensive machine tabulations were used for the processing of the data.

The quantitative findings appear to be consistent with the following hypotheses:

1. Exhaustion can be viewed as evidence of worker "marginality."
2. The strength of the relationship between personal characteristics and reemployment declines with the length of the unemployment period and as the cyclical level of unemployment increases.
3. Inter-firm and inter-industry immobility contributes to exhaustion.
4. The Marion County women studied here could usefully be characterized as having been "exhaustion prone" over their whole work history.
5. The concept of "seniority" was not closely related to reemployment after exhaustion for women in the subsample.

Relative to public policy it is suggested that a shorter duration of benefits with weekly benefit amounts a decreasing function of time could effect an inter-claimant transfer of income which would be consistent with the relation of benefit payment to discounted future marginal productivity, encourage labor mobility, and add to the stability of a growing economy that is subject to cyclical fluctuations. Microfilm \$2.50; Xerox \$8.40. 185 pages.

A STUDY OF THE LABOR PHILOSOPHY DEVELOPED WITHIN THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS

(L. C. Card No. Mic 60-389)

J. Kenneth Davies, Ph.D.
University of Southern California, 1960

Chairman: Professor Pollard

The Mormon people constitute a dominant force in Utah and are becoming increasingly so in many of the remaining western states. A labor philosophy developed by them can have important sociopoliticoeconomic consequences. In this study, the author attempts to systematically present the major forces affecting the development of a labor philosophy and to characterize that philosophy which appears to have been developed by the various levels of Church leadership and membership.

Both primary and secondary sources were used for the development of the information contained in this work. The standard Mormon scriptures, along with commonly accepted commentaries, were used to develop the ma-

terial on the theology and organization of this religious body. Pamphlets, theses, and published histories, as well as such primary sources as newspapers and journals, were used to develop historical data. Original addresses and articles by Church leaders were consulted to determine their attitudes. The editorials of the Church-owned and -edited newspaper were studied intensively. A scientifically selected cross section of the Church membership and local leadership inside continental United States was administered a questionnaire to determine their attitudes toward certain labor questions. Finally, a summarization was made of the entire study, and certain problems were pointed out along with some recommendations.

The labor philosophy of the Mormon people has resulted from two processes—revelation and rationalization. The revelation, finding its way into scripture, established general guides of conduct which should be transferred to specific labor situations. No revelation has been reported which would establish the legitimacy or illegitimacy of labor unions or the bulk of their goals and devices. The Church has hesitated to come out authoritatively on these subjects. Individual leaders have voiced their opinions, but they remain unofficial. The authoritative structure of the Church could possibly establish by dictum a labor philosophy, but so far it has not done so. Even in the absence of such dictum, it might be expected that the attitudes of the leaders would have a definite influence on that of the people. This study fails to establish such a relationship, though there are some strong suggestions that such may exist.

The Church leadership and membership have developed a rather conservative philosophy of labor. The extent to which this conservatism has been directly determined by Church history, organization, and theology is not definitely known, though they appear to have had some effect. This conservatism has increased with the passage of time.

The idea that workers should have the right to organize and select a representative to bargain for them with management has found acceptance within the Church on all levels. However, the compulsory nature of much of the labor structure is rejected. This would definitely preclude closed shops and automatic checkoffs. Lesser forms of union security are questionable so far as leaders are concerned but are acceptable to the membership. A real open shop would probably be the most acceptable.

There has developed strong resistance on all levels to such devices as violence, featherbedding, wildcat strikes, mass picketing, secondary boycotts, jurisdictional disputes, sympathetic strikes, and general strikes. There is also general resistance to lobbying by unions as well as to their participation in political campaigns. Also resisted are union efforts to establish certain forms of personal security such as seniority and the guaranteed annual wage. However, the improvement of hours, wages, and working conditions is generally approved.

There are strong differences of opinion within the Church on the subject of labor. Should either of the extremist viewpoints come to dominate, internal strife could result. Microfilm \$5.80; Xerox \$20.50. 455 pages.

THE JAPANESE ECONOMIC DEVELOPMENT OF MANCHURIA, 1932 TO 1945.

(L. C. Card No. Mic 60-867)

Ramon Hawley Myers, Ph.D.
University of Washington, 1959

In late 1931, the Japanese Kwantung Army over-ran Manchuria and soon after initiated a program of rapid industrialization. Previous to this date, the region had developed primarily on the basis of the important staple export trade of soy bean products. This had been made possible by foreign capital investment in railway development and the immigration of Chinese farmers and laborers from North China. Japanese economic organization and planning became more sophisticated and complex as external pressures forced the Kwantung Army to hasten its industrialization program. After 1937, a five year plan made its appearance and was implemented by such control measures as the resource mobilization plan, control of foreign exchange, price controls, and a series of regulations relating to mobilizing and allocating labor and capital to industry.

In this study, output achievements within different economic sectors (agriculture and industry) have been compared to the original projected targets in the five year plans of 1937 and 1942. From this it was seen that industrial output increased at a rate of growth comparable to that achieved in the Soviet Union in her early five year plans. In agriculture on the other hand, the traditional small scale production unit, lack of credit facilities, and failure of landlords and wealthy farmers to introduce innovations limited the expansion of farm output. We find that the principal means the Japanese military succeeded in obtaining farm surpluses were by expanding cultivation along traditional farming methods and fairly effective administrative control over rural markets.

While remarkable progress was made in building an industrial complex, formidable problems of labor recruitment, high labor turnover, and shortage of skilled labor caused the rate of industrial output to slacken in the late 1930's and again in 1943 and 1944. The ability of the Japanese to build plant capacity in Manchuria rested largely upon large capital imports from Japan and favorable terms of trade for Manchoukuo. This financing of capital accumulation was further augmented by the Manchoukuo state's budgetary policy of inflationary financing.

The pattern of economic organization and control changed sharply over the period. In the beginning, government regulations were moderate and enterprises made their decisions solely by the price mechanism. After 1937, state managed purchasing companies were created and numerous controls were introduced. In the planned economy of Manchoukuo, the distribution system was controlled by the state and prices administered by the purchasing companies. Production units in agriculture, mining, and industry had to adapt to these prices and adjust output schedules to realize quotas and targets stipulated in the general economic plan. The elasticity of money supply and availability of credit were carefully controlled by the state planners and administrators.

Basic resource scarcities, imbalances of input requirements for different sectors, and failure to utilize considerable new industrial capacity in metallurgy and electrical power generation, all reflected the failure of

Japanese planners to utilize resources effectively and avoid waste. These difficulties stemmed from the deliberate policy of forcing an imbalanced growth process. Microfilm \$4.35; Xerox \$15.30. 340 pages.

THE ECONOMICS OF PATIENT CARE AT THE UNIVERSITY OF WISCONSIN HOSPITALS

(L. C. Card No. Mic 60-1017)

Robert Laird Robertson, Jr., Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Edwin Young

This dissertation represents a study of the major economic features of the provision of medical care (or "service") to patients at the University of Wisconsin Hospitals (or "University Hospitals"). It analyzes three basic economic aspects of patient service:

- (1) Determinants of the demand for care;
- (2) Determinants of the supply of care;
- (3) Pricing of care.

From these analyses and from a consideration of the proper role of University Hospitals, conclusions are drawn and recommendations affecting public policy are made.

The research methods employed in this study basically involved reading and personal meetings. The author surveyed the pertinent literature on hospital economics in general and University Hospitals in particular. He also conducted interviews with officials in a representative sample of counties and had discussions with state officials and interested private parties in Wisconsin.

Among the findings of this study is the fact that, in practice, private physicians are the most important parties in determining the location at which persons -- whether publicly-supported or paying patients -- are to be treated. This fact and various trends, which include an expansion of local medical facilities and liberalization of the categorical assistance medical programs in the state, have restricted the demand for care at University Hospitals, a situation which appears likely to continue.

The probability that average daily costs of providing service at University Hospitals will continue to rise is another finding. There also are many non-monetary factors in the determination of the supply of care at those institutions.

Rates are set by the managers of University Hospitals in an effort to equate total revenue with total cost. In the past, if a deficit was incurred, prices were simply increased, but it is possible that a practical rate ceiling has been reached. The managers will supply any quantity of service up to full capacity, and the volume actually sold is determined by the purchasers.

The author stresses in his conclusions the need for a clear decision by state officials as to the proper role to be performed by University Hospitals and the desirability of applying a policy for financing the institutions which is consistent with the role selected. In his view, developments since the founding of the institutions have led to a

situation in which University Hospitals now function primarily to advance medicine through housing the activities of teaching and research. Their role in the care of patients has become a secondary factor.

The implications of this view are that the load of patients at University Hospitals must be of a size and type suitable for supporting the educational activities of the University Medical Center, with which the institutions are associated. Thus, the current requirement that the institutions cover all their costs through receipts from patients (and public agencies supporting them) appears unrealistic, as well as being unfair to the patients. In addition, the probability that costs will continue to rise and the danger that University Hospitals will "price themselves out of the market" lead to the conclusion that some source of financing supplementary to patient charges must be found. It is the writer's opinion that the best mechanism for this is a direct subsidy by the state.

Microfilm \$3.90; Xerox \$13.75. 301 pages.

**UNFAIR LABOR PRACTICES UNDER THE
LABOR-MANAGEMENT RELATIONS ACT, 1947-57:
A STUDY OF N.L.R.B. CASES PERTAINING TO
THE UNFAIR LABOR PRACTICES OF UNIONS
UNDER SECTION 8(b) OF THE ACT.**

(L. C. Card No. Mic 60-1222)

James Elmer Young, Ph.D.
The Ohio State University, 1959

The Labor-Management Relations Act of 1947, as amended, is a regulatory bill. It differs from the National Labor Relations Act of 1935 in that it regulates relationships after collective bargaining has been established as well as pre-bargaining relationships. One important change in this regard effected by the Labor-Management Relations Act is contained in Section 8(b) wherein a number of unfair labor practices are imposed upon labor organizations in addition to those imposed upon employers under Section 8(a).

This study gives an account of developing public policy and the law toward unions and collective bargaining under Section 8(b) of the Labor-Management Relations Act, exclusive of subsection (4) concerning secondary boycotts and jurisdictional disputes. The policy developments are those reflected in an examination of the decisions and orders of the National Labor Relations Board and the court decisions arising from those of the Board for the ten-year period, 1947-57.

An attempt is made to analyze and appraise the nature and extent to which the application of this portion of the Act has or has not fallen short of the intent of the Congress as indicated in the statement of findings and policy in the Act.

To some degree all of the subsections are characterized in the course of their development by a complexity of meaning leading to confusion in interpretation and to uncertainty for the parties involved. This uncertainty has been added to by the inconsistency of the Board in some of its rulings and policies on the same subject.

Other factors which stand apart from substantive developments under Section 8(b) are limits set on the

application of the relevant subsections of the Act by discretionary jurisdictional standards of the Board, the filing requirements placed on unions by Sections 9(f), (g), and (h), the time limitations of Section 10(b), certain definitional limitations in Sections 2 and 8, treatment of labor organizations under the common law of agency, the inappropriate emphasis given to legal procedures, and the time lag in processing cases.

Individual employees and union members have gained important protection in the employment relationship under Section 8(b)(1)(A) and 8(b)(2) as well as in their relationship with the union. Several advantages also have accrued to employers under Section 8(b) provisions. While a few of the policies herein studied are positive contributions encouraging collective bargaining, on the balance most have tended to be disruptive of if not discouraging to the practices and procedures of the bargaining process. The public has benefited little from these policies compared with the benefits of individuals and employers. Also, these advantages gained have been paid for by impairments to the bargaining process as well as by restrictions imposed on unions which limit their effectiveness in the bargaining process.

The conclusions of the study offer a basis for several needed changes in the Act. Section 8(b)(4) should be amended to cover limited forms of organizational and recognition picketing. The vague language of Section 8(b)(1)(A) could then be eliminated. Section 8(a)(3) should be changed to permit the closed shop arrangement while Section 8(b)(2) would serve as a guarantee of no closed unions. Changes are also suggested for Sections 8(b)(3), (5), (6), Section 2(11), and Sections 14(b), 10(b), and 10(j) as well as for jurisdictional problems of the Board.

Microfilm \$4.55; Xerox \$16.20. 356 pages.

ECONOMICS, AGRICULTURAL

**AN EXTENSION METHOD OF
FARM MANAGEMENT TRAINING**

(L. C. Card No. Mic 60-1172)

Neal Ross Carpenter, Ph.D.
The Ohio State University, 1959

In southeastern Ohio, soils are relatively unproductive; farm labor is frequently not fully employed; and farm incomes are low. Quality and amount of resources limit farmers' opportunities to increase earnings. Farm management specialists feel that the most feasible way to raise farm income in this area is to improve the efficiency of factor use through better organization and management of land, labor, and capital.

The Ohio Extension Service, accordingly, has developed various methods of farm management training for farmers. In 1956 a method of formal training was introduced and activated whereby management specialists and representatives of agricultural credit and service agencies supplemented the County Agricultural Extension Agent in conducting a series of classes for a selected group of farmers. The purpose of the training was to make the

operators aware of the profit maximizing principles applicable to proper farm organization on their own units. Classroom instruction was integrated with individual planning aid and actual visits to the farms. Emphasis was placed on decision-making by the operator himself in terms of his own resources and limitations.

The primary objective of this study is to determine the degree to which the training program has been responsible for raising farm income on those farms which participated in the 1956 training classes. Twelve sample farms were studied. On two of these, for non-economic reasons, the operators realized less labor income in 1958 than in 1955. The other ten operators increased returns in the three-year period, averaging \$1,006 labor income in 1955, the year before the training program, and \$3,703 in 1958. This \$2,697 gain was due, of course, to all variables, including increase in resource amounts, change in cost-price relationships, difference in the value of the dollar, normal managerial experience gained during the three-year interim period, and improvement of the management factor due to the management training course.

Methodology was developed whereby the amount of gain in labor income attributable to management increase from 1955 to 1958 could be isolated from that gain resulting from all other factors. The \$2,697 labor income increase in 1958 over 1955 was obviously due to change in all factors.

Linear programming solutions were run for each individual farm for 1955 and for 1958, using the production resources available to the operator for that particular year. Input and output coefficients used were consistent with the given farm and operator. Because both years involved the same manager, the management factor was regarded as being held constant, while the solutions reflected optimum resource combinations for all other factors. The gain in labor income in 1958 over 1955 was thus a measure of increase attributable to all variate changes except management. This value (\$762) was subtracted from \$2,697. The residual of \$1,935 was therefore considered to be a rough indication of the increase in labor income due to change in the components of the management factor.

Subjective evaluation of these components, based primarily on the experience and observation of the writer and other farm management specialists, coupled with scrutiny of allied projects, leads the author to feel that a major part of the \$1,935 gain can be attributed to the training program used. In any event, the change in income due to all aspects of management improvement is significant in this program.

A major objective of the study was to present a methodological procedure whereby training programs of this type can be evaluated. The author feels that the technique presented here is effective, but suggests improvement through larger sample size, use of supplemental regression analysis for better relationship isolation, and greater emphasis on data accuracy through longer range planning.

Microfilm \$2.50; Xerox \$8.00. 171 pages.

THE ROLE OF FARMERS' COOPERATIVE ASSOCIATIONS IN THE MARKETING OF DARK TOBACCO IN KENTUCKY-TENNESSEE FROM 1931 TO 1950

(L. C. Card No. Mic 60-640)

Harold Brown Clark, Ph.D.
University of Kentucky, 1950

The marketing of dark tobacco in Kentucky-Tennessee since 1931 has been profoundly influenced by the operations of the three dark tobacco cooperative marketing associations which have served the entire Dark Belt. From the beginning, these associations have supported the prices of dark tobacco by standing ready to make advances to members when their tobacco failed to bring predetermined minimum prices. Although originally organized to provide self-liquidating marketing services, as the economic position of the dark tobacco farmers, and of farmers generally, grew worse, the associations gradually became implementing agencies of national production control and price support programs. Because the associations were organized with the help of the same men to achieve the same ends, the marketing contracts and methods and plans of operation for the three associations have been almost identical. The strategic role which the associations have played has increased their importance in the entire marketing system. Not only have they been implementing agencies of government, but they have served and protected the interest of members and have performed a real service to the dark tobacco trade.

The keystone position which the associations have attained and the unique functions which they have performed have created unusual problems in management. The purpose of this study has been to describe and analyze the operations and managerial problems of the associations, to investigate the more important policy implication of these operations, and to discuss the effect of the government price support program and operations of the associations upon the farmers, the dark tobacco industry, and society at large. The purpose of the study has not been to analyze the government program for dark tobacco, but only that part of the program which has directly affected the operations of the dark tobacco associations.

There are many things different about the associations. The features of the dark tobacco associations which sets them apart from conventional marketing business units is their function in supporting the price of dark tobacco. The associations' experiences in operating their own auction warehouses, prizeries, and storage facilities and their insurance experiences have provided the associations with a basis for bargaining with private firms over charges and rates, and has resulted in reduced charges and rates throughout the Dark Belt.

The strategic position of the association in the marketing system places unusual personnel and personal strain upon management. Not only must the managers be able to administer and work with employees and directors, but they must also work and bargain with government officials, warehousemen, prizery operators, and members.

Selling has always been one of the chief functions of the associations. The problems involved are different from those of other marketing businesses.

Financial problems of the associations likewise are

unorthodox. Funds are supplied by the government and are non-recourse. However, the associations are self-financing so far as administrative and operating expenses are concerned.

The cost to the government of the dark tobacco subsidy program amounted to six and one-half million dollars for this 18-year period. The figure does not include the cost of byproduct diversions during the war which were used for insecticides, nor does it include administrative costs incurred by the government.

Should the cost be borne (1) by individuals, (2) by society, or (3) by individuals and society? In the case of dark tobacco both individuals and society have shared the cost. Patently, this is fair as benefits have been shared by both the individuals and society.

In the final analysis, one must ask: would the social cost of not having a subsidy program have been greater than the cost of having a subsidy program? The evidence favors a positive answer, at least for the period under consideration, 1931-1949.

By building upon past experience in cooperative marketing and by trial and error, the dark tobacco associations have worked out a successful plan of operation--a plan which has been adopted by other tobacco cooperatives throughout the United States and Puerto Rico. The associations service the trade by providing them with a reservoir of tobacco stocks which can be drawn on at a price which can be calculated in advance. To a degree the trade now has some of the advantages which a futures market provides. Hence, the trade does not have to stock as heavily as it otherwise would, and the cost and risk of carrying inventories is diminished. Speculation is reduced. Dealers' margins are therefore less than formerly.

Members and the government are provided with services in addition to those resulting from marketing dark tobacco. The associations have been a bridge for two-way traffic between the individual tobacco farmer and the government.

Microfilm \$3.80; Xerox \$13.50. 296 pages.

A MANAGEMENT AUDIT OF FORTY-FOUR COUNTRY ELEVATORS IN WESTERN OHIO

(L. C. Card No. Mic 60-1179)

Harold J. Ecker, Ph.D.

The Ohio State University, 1959

Country elevators represent an important segment of Ohio's agricultural economy. Wide variations exist in the efficiency of country elevators. To a large degree the differences in efficiency appear to grow out of differences in methods and techniques used in managing and operating the business. The purpose of this study is to provide elevator managers with information that can be used to assist them in solving their management problems and thereby increase the profits of the firm and improve the over-all efficiency of the elevator industry. In this study an attempt is made to isolate and analyze differences in income and expense relationships between the relatively successful and unsuccessful elevator operations in Ohio. An attempt also was made to determine the management techniques responsible for success or failure in the elevator industry.

The sample consists of 44 country elevators in western Ohio stratified according to eight size groups. Individual elevators within each size group were selected on the basis of their reported profit per dollar of sales. One-half of the sample represented the most successful and one-half represented the least successful elevators in each size group.

It was found that the successful elevators obtained higher gross margins on merchandise handled than did their less successful competitors. The high profit firms also received a larger percentage of their total income from the sale of services. It appeared that the quantity and quality of services offered determined the maximum gross margins that could be charged without unfavorably affecting the volume of sales.

The difficulty in the low profit firms did not appear to be on the cost side of the ledger. The low profit firms had higher asset turnover, higher inventory turnover, lower accounts receivable, and lower total costs per dollar of sales. The high profit elevators had more invested in buildings and equipment per dollar of sales, paid higher wages, and spent more on advertising than their less successful competitors.

It appears that competition in the elevator industry was only to a limited degree price-oriented. Rather, competition was manifested primarily in efforts to provide additional services for the convenience of the customers.

Microfilm \$2.50; Xerox \$5.80. 120 pages.

AN ANALYSIS OF THE FINANCIAL STRUCTURE OF AGRICULTURAL COOPERATIVE BUSINESS ORGANIZATIONS IN OHIO AND SUGGESTIONS FOR IMPROVEMENT

(L. C. Card No. Mic 60-1192)

Robert Edwin Laubis, Ph.D.

The Ohio State University, 1959

Ohio cooperatives in 1956 were financed with common stock, preferred stock, surplus, reserves, allocations, membership capital, certificates with and without maturity dates, and debenture bonds. Forms of capital added to the capital structure of Ohio cooperatives between 1940 and 1956 were (1) classifications of both common and preferred stock, (2) certificates without maturity dates, and (3) debenture bonds. Borrowed capital was considered an instrument in the development of the capital structure but not a part of the capital structure.

Participating in this study were 76 selected Ohio cooperatives sampled in two separate groups. The initiation of this financing project was prompted by the interest of 12 members of the Ohio Council of Farmer Cooperatives. Data concerning the first sample of 41 cooperatives was obtained from three major sources: (1) a questionnaire regarding financial practices for a selected period, (2) an interview with the management of all associations studied and with the directors of selected associations, and (3) selected annual audit data for the fiscal years of 1940-41, 1945-46, 1950-51, 1955-56 and 1956-57. A second sample of 35 additional associations was obtained for the fiscal year of 1956-57, which served as a verification of the data obtained in the first sample of 41 associations.

The development of the capital structure of a local association was greatly influenced by the form in which patronage refunds were received from state wholesale and regional associations. Problems of capital structure development were more closely related to the permanency of capital and to the complexity of the financial structure than to the commodity group to which a given cooperative was associated. For analysis, cooperatives were divided into three groups: (1) associations having common stock as their only stock, (2) associations having a combination of common and preferred stock, and (3) associations having no stock.

Some of the factors affecting the capital structure of cooperatives were the par value or stated value of stock or memberships, the frequency and consistency of the payment of dividends on stock and other securities, the redemption policy of both voting and non-voting securities, and member and patron faith and loyalty to the business entity. The two most common stock par values were \$5.00 and \$10.00, while the most used par value for preferred stock was \$50.00. The range of par values of common stock was from \$1.00 to \$100.00 and the range of values of preferred stock was from \$5.00 to \$100.00. Both common and preferred stock had yielded a 4 per cent dividend rate, with less than 50 per cent of common stock issues receiving no dividend payment.

The capital structure of the associations transacting business directly with farmers changed during the 16 years included in this study. The use of permanent forms of capital decreased from 76 per cent in 1940 to 63 per cent of net worth in 1956. The use of semi-permanent forms of capital fluctuated considerably during the period studied, with 27 per cent of the net worth being the amount utilized in 1956. Non-permanent forms of capital showed a substantial increase from 2 per cent of net worth in 1940 to 10 per cent in 1956.

Fixed assets by 1965 are expected to be 25 per cent of the total assets, which is approximately the same amount required in 1955. The amount of net worth by the fiscal year of 1965 was expected to be 54 per cent of the total assets, which was less than the percentage registered during the 1940 period for these selected cooperatives.

Microfilm \$4.10; Xerox \$14.40. 319 pages.

DEVELOPMENT AND EVALUATION OF ALTERNATIVE METHODS OF PREPARING FLEECE WOOL FOR MARKET

(L. C. Card No. Mic 60-1200)

Russell Fudge McDonald, Ph.D.
The Ohio State University, 1959

Significant differences exist between market preparation of foreign and domestic fleece wools. Domestic wools currently are handled much in the same fashion as they were nearly a century ago. The usual practice of tying all portions of the shorn fleece in a common bundle lowers the quality of the wool product being marketed and consequently the price per pound received. Both quality and price compare unfavorably with the highly uniform skirted lots of foreign wools being imported into this country. The favorable market acceptability attained by foreign

growers largely because of improvements in the put-up of their wools suggests the desirability of studying the possibility of similar methods of marketing fleece wools.

The general objectives of this fleece wool marketing project were to study comprehensively alternative methods of preparing fleece wool for market and to find ways to improve the marketability of fleece wools by evaluating the various alternatives.

Four basic alternative methods of improving the marketability of fleece wools were explored. Two of the four--moving farm flocks to a central shearing center or moving the shearing and sorting unit to the farm flocks--were rejected primarily because of the estimated cost of buildings, equipment, and labor as well as producer resistance to the change in wool handling and shearing methods. The third and fourth methods were tested in a controlled experiment.

Under the third alternative, the on-the-farm method, sheepshearers were trained to perform the sorting operation by a revised shearing technique. The sorted wool product varied considerably. The variation resulted from differences among sheep within and between flocks and differences in the methods of sorting used by the various shearers. The variation in methods employed by different shearers occurred despite efforts made to train and supervise performance of the shearers.

Under this alternative, off-sorts, such as stained, burry and seedy pieces, tags, and kempy portions of each fleece, were removed. The farm sorted and warehouse graded fleeces were bagged in tied form and offered for sale. A net gain of 0.5 cents per pound overall cents was realized.

Under the fourth alternative, carried out in the warehouse, a single lot of graded wool (35,000 pounds) was sorted. In the sorting process all strings, stains, tags, and seedy and burry portions of each fleece were removed. This method yielded a large lot of a highly uniform product. The sorted product was bagged in an untied form and offered for sale. The homogeneity and high quality of the sorted lot was confirmed by the buyer. He reported that no further sorting or handling was required. The wool was merely opened and dumped in the scouring vats (trap-sorted).

The warehouse alternative compared with the farm alternative yielded about \$1.00 more per hundredweight, and cost about 7 cents less per hundredweight to prepare. Compared with wool as normally handled by a marketing agency, the fourth method (warehouse alternative) returned about \$375.00 more per carload after deducting all costs.

On the basis of the various alternative wool preparation methods explored, the warehouse method appears economically sound but additional research is needed to refine the technique further, develop improved descriptive measures, and more accurately determine normal expected gains before blanket recommendations for adoption can be made. Microfilm \$2.55; Xerox \$8.80. 194 pages.

REORGANIZATION OF CONTIGUOUS SMALL FARMS FOR THE MAXIMUM ECONOMIC RETURNS

(L. C. Card No. Mic 60-1214)

Ram Ratan Singh, Ph.D.
The Ohio State University, 1959

The low income of small farmers, especially in densely populated parts of the world, is becoming increasingly important. Society feels an obligation to support, at least in part, the people operating and depending on small farms for their livelihood. Consequently, the people of an area or a nation are willing to help small farmers improve their living standards.

This study explores methods by which small low-income farmers might improve their incomes and hence their standards of living. The possibility of more effectively utilizing limited resources on small farms was examined and a research method developed for reorganizing the use of existing resources.

The study was primarily undertaken to examine the possibility of its application in the villages of India. In the absence of available data from India, a situation with conditions somewhat comparable to a village in India was selected in Madison County, Ohio. Twelve small contiguous farms which are a part of the old Scioto Resettlement Project were selected for study. Information relating to the resources of these farms was obtained by personal interview. Additional input-output data, prices, and other relevant information were obtained from the offices of Farmers' Home Administration, The Conservation and Stabilization Committee and Soil Conservation Service, London, Ohio, and Farm Management Specialists of Ohio State University.

The farms were reorganized to maximize returns at two levels. First, for the short-run period, each farm was replanned to incorporate such technological advancements as soil improvement, changes in crop rotation, increased use of fertilizers and improved output of livestock and livestock production. This is intra-farm reorganization. Second, for the long-run period, the contiguous small farms were grouped into four units of three farms each and then a larger unit of 12 farms. Within these combined units, field machinery is operated on the larger acreage, and barn equipment and herd sires are associated with a larger number of animals. This is inter-farm reorganization.

As a result of intra-farm reorganization, production increases with a relatively small increase in expenses; hence, net income increases. In inter-farm reorganization, economies in capital investment for machinery and herd sires occur and additional income is obtained by the replacement of surplus herd sires with sows, cows and ewes.

The average estimated income per man-hour of labor employed at the farm increased from an actual of \$.36 before reorganization to \$1.20 from a fully established intra-farm reorganization. This was after allowing a credit at 4 per cent for real estate capital and 6 per cent for chattel capital. The corresponding average estimated income per man-hour on inter-farm reorganization of machinery on the 3-farm units was \$1.50 and on the 12-farm unit, \$1.87.

The average estimated capital investment per farm on

intra-farm reorganization increased from an actual of \$25,595 to \$28,765 but decreased with the inter-farm reorganization of machinery on the 3-farm and 12-farm units to \$26,679 and \$23,179 respectively. When both machinery and herd sires were regrouped, the capital dropped to \$25,356 and \$21,047. The number of man-hours employed increased on each farm after intra- and inter-reorganization. The goal of improvement in income is therefore realizable.

Socio-psychological values will be affected by inter-farm reorganization. The importance of these values needs to be evaluated before this type of reorganization can be recommended. However, it was found in this study that economic gains can be realized by reorganization at both levels. The method developed provides a tool to increase income on small farms but should be tested by experimentation before widespread application is made.

Microfilm \$2.50; Xerox \$7.60. 164 pages.

COMPARATIVE RETURNS TO RESOURCES USED ON DIFFERENT TYPES AND CLASSES OF FARMS BY MAJOR TYPES OF FARMING AREAS IN OHIO AND NEIGHBORING STATES

(L. C. Card No. Mic 60-1217)

Gustavo Adolfo Tejada, Ph.D.
The Ohio State University, 1959

Agriculture in this country is concerned with the problem of rates of return to agricultural resources and differentials in performance and efficiency among sectors within agriculture.

This study is aimed at the determination of the extent to which an imbalance in returns exists in distinct farming types and areas in Ohio and nearby counties. The three basic objectives were (1) to obtain an indication of the magnitude and the nature of the differentials in returns to resources used within and among areas; (2) to study the relationships between farm size and levels of efficiency; and (3) to analyze the possibilities of desirable adjustments and indicate general directions in which the shifting of resources would procure a high level of productivity in farming.

Aggregate data for the regions and types of farm studied were the main basis for the analysis. Considerable use also was made of secondary sources through governmental agencies, research findings, and data from institutions and individuals. Types of data not available in the desired breakdown were estimated. These included value of home-consumed food, rental value of farm home, and several of the inputs costs. The input-output method was used to obtain residual return to various factors of production.

Differentials in levels of returns to resources which were found indicate that appreciable gains could be attained from reallocation of farm resources. Types of resources with the greatest need of reallocation were labor and land resources. Inefficiencies were greatest in regions where the number of small farms was large in proportion to total number of farms and where opportunities of labor mobility out of agriculture were limited. This was particularly the case in the eastern, south, and

southwestern areas of Ohio. The northwestern and west-central regions showed generally higher levels of return to resources. The residual returns to labor per worker in a substantial portion of the areas covered were materially lower than average income per capita in occupations other than agriculture. Small farms and medium-sized farms had average returns to labor per worker and average rates of return on investment considerably lower than the opportunity costs of such resources. Some showed negative returns to a given factor when all other factor inputs were valued at their market price.

The continuance of operation of small, inefficient farm units despite meager returns to resources used may find its explanation in the high proportion of relatively fixed factors (farm family labor and investment in real estate) that characterizes them. Since these fixed factors have little possibility in other employment, the small farmers have no alternative but to continue in farming. Fixed costs in these small farms were between two-thirds and three-fourths of total cost.

Returns to marginal capital indicated that possibilities for increase in farm size are great in most of the types of farms studied. Generally, marginal rate of return on added investment was considerably higher than average rate of return on capital in the smaller class and was above the normal interest charge. Economies resulting from a higher level of operations appear to explain why farmers can afford to pay present prices in order to obtain additional land and to increase size of operations.

Problems of inefficiencies in farming created by the large number of farmers operating uneconomical units present a substantial case for the reorientation of agricultural programs from their present objectives of farm price support and other forms of subsidies and control to a resource reallocation program. Results of the analysis strongly indicate the need of recombination of small units into larger units and transfer of part of the human resources used in agriculture to non-farm employment.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

ECONOMICS, COMMERCE-BUSINESS

THE SALESMAN IN THE AMERICAN NOVEL OF THE TWENTIETH CENTURY

(L. C. Card No. Mic 60-1106)

Frederic J. Meystre, Jr., Ph.D.
New York University, 1959

The purpose of this investigation was to identify the treatment of the salesman in American novels from 1900 to 1958, and to determine: (1) whether there was a true fictional stereotype of the salesman; (2) to evaluate the status of the salesman in his fictional setting; (3) to investigate the changing patterns in the presentation of the salesman over the time-span of the study.

The term salesman was defined as one who practices persuasive leadership to bring about buying action. As used in the investigation, the term included traveling salesmen, specialty salesmen, and the Madison Avenue

'huckster'--the salesman of television, advertising or public relations services.

The study was divided into three time spans for convenient comparison: 1900-1918; 1919-1945; and 1946-1958. Characters were set in the time span in which they lived, rather than in the year in which the novel was published. For the most part, only major characters were studied; that is, salesmen who were the heroes or the villains. Merchants who traveled salesmen were included but sales clerks were not.

The investigation revealed that there was no valid stereotype of the salesman. The generic term salesman consistently had to be broken down in two fundamental ways: (1) by traveling, specialty salesmen and hucksters and (2) by the various role aspects. It was not possible to reassemble these data into a whole which would be so simplified and so universal that one could say, "Here, at last, is the true salesman of fiction; this man, above all his sales brethren, represents the image we carry away with us when we hear, or read, the word salesman." In short, there was neither a stereotype of a salesman nor was there uniformity of depiction of the salesman by novelists.

The answer to the second subproblem was also negative. The pre-World War I salesman was not concerned with status-seeking; the salesman of the twenties definitely was; the Depression salesman had to work too hard to be worried about status; and the post-World War II salesman did his status-seeking mostly within the company he worked for, although the hucksters were given to some striving, especially in the matter of his residence.

The pattern of portraying the salesman went through four phases. The pre-War I salesman was Horatio Algeresque, working hard at "playing the game." The salesman of the twenties was full of Zip and Bang; the salesman of the thirties was a realist concerned with survival; and the post-War II salesman was usually the Madison Avenue huckster who sold services rather than a product and who emphasized personality above all else. The huckster, however, was a competent salesman, as were practically all of the salesmen portrayed in novels.

The depiction of the salesman was, on the whole, such as to diminish the stature of the salesman in the minds of readers. The social implications of this treatment are unfortunate, for current literature tends to diminish the true contribution of the salesman to the American economy at a time when America needs more salesmen than ever before. Microfilm \$4.70; Xerox \$21.20. 368 pages.

ELECTRONIC DATA PROCESSING AND ITS IMPLICATIONS FOR THE COLLEGIATE BUSINESS CURRICULUM

(L. C. Card No. Mic 60-1206)

Leo Niemi, Ph.D.
The Ohio State University, 1959

The main purpose of this investigation was to determine the knowledge, skills, and understandings of electronic data processing that colleges and universities should provide their business students.

A questionnaire was used to survey heads of computer

installations in 30 insurance and banking firms, 19 governmental agencies, 52 manufacturing concerns, 26 equipment manufacturers, 7 public accounting firms, and 28 colleges and universities.

Seventy-six per cent of the respondents reported that their computers were used for business data processing 80 to 100 per cent of the time. A total of 681 business applications of 48 varieties were reported by 114 computer users. The ten most popular computer applications, ranked in descending order, were (1) statistical analysis, (2) payroll computations, (3) customer (premium) billing, (4) report preparation, (5) inventory control, (6) general accounting, (7) cost accounting, (8) financial statements, (9) budget preparations, and (10) dividend procedures.

Four or more years of college education were recommended for the prospective head of an EDP unit. Forty per cent of the curriculum was to be devoted to business courses; 25 per cent to mathematics; and 20 per cent to liberal arts.

Educational deficiencies observed in prospective EDP managers by the various respondents were, in order of descending rank, in (1) mathematics, (2) business, (3) liberal arts, (4) electrical engineering, and (5) other subject areas.

The specialized computer courses recommended by a majority of the respondents for the prospective head of an EDP unit, in descending order of rank, were (1) General Orientation to EDP, (2) Digital Computer Programming, (3) Business Systems Analysis, (4) Business Applications, (5) Digital Computer Operation, (6) Advanced Programming Techniques, (7) Industrial Applications, (8) Numerical Analysis, and (9) Operations Research.

General Orientation to EDP and Business Applications were recommended by the majority of the respondents as desirable courses for managers other than EDP managers.

Colleges and universities were indicated as the first choice of training agency by the majority of the respondents for the following courses: (1) General Orientation to EDP, (2) Business Applications, (3) Business Systems Analysis, (4) Industrial Applications, (5) Numerical Analysis, and (6) Operations Research.

Computer manufacturers were indicated as the first choice of training agency by the majority of the respondents for (1) Digital Computer Programming, (2) Advanced Programming Techniques, and (3) Digital Computer Operation.

One section of the questionnaire was devoted to the educational experience of the respondents themselves who were presently employed as data processing managers. A substantial majority had four or more years of college education. About 30 per cent of these had graduate degrees. Among the collegiate subject areas from which majors were taken were, in order of rank, (1) business, (2) mathematics, (3) liberal arts, (4) engineering. Accounting majors in business led the others by a substantial margin; physics was the most frequently reported major in liberal arts; and electrical engineering was the most popular among the engineering majors. Physics and economics were the most frequently reported minors.

The special computer courses taken by employed Electronic Data Processing managers, in order of descending rank, were (1) Digital Computer Programming, (2) General Orientation to Computers, (3) Digital Computer Operation, (4) Advanced Programming Techniques, (5) Business Applications, (6) Business Systems Analysis,

(7) Numerical Analysis, (8) Industrial Applications, and (9) Operations Research.

The rank of courses recommended for prospective managers compared with the rank of courses taken by employed managers reflects a trend away from the physical aspects of the computers themselves and toward the uses that can be made of the computers.

Microfilm \$3.05; Xerox \$10.60. 234 pages.

SUPERVISORY PRACTICES OF EFFECTIVE AND INEFFECTIVE FOREMEN

(L. C. Card No. Mic 59-1497)

Quentin Dean Ponder, Ph.D.
Columbia University, 1958

The objective of this research study was to determine the differences in supervisory practices, communication patterns, and work direction techniques between the most-effective and the least-effective foremen at a plant of the General Electric Company. An effective foreman was defined as one who contributes on an optimum basis to corporate objectives which relate both to profitability and to the achievement of favorable attitudes of employees. These criteria included performance appraisals of the foremen by two levels of management, rankings of the productivity of the foremen's own work groups by two levels of management, and attitudes of the employees toward the performance of the foremen. The above criteria were obtained for approximately 100 production foremen in a manufacturing plant. The twelve highest-rated and the twelve lowest-rated foremen were selected on the basis of a composite of these criteria for detailed observational study.

Behavior variables observed were as follows: (1) topic of foremen activity, (2) party with whom the foreman was in contact, (3) party who initiated the contact, (4) the manner in which communication between the two parties started, (5) the pattern of the flow of information, and (6) the type of work direction and/or communication the foreman utilized. Each of the foremen was observed for eight 2-hour periods. Detailed notes were taken on his behavior patterns in accordance with the above behavior variables.

Each behavior pattern observed was punched on an IBM card in accordance with an IBM code which had been prepared to represent each possible behavior pattern. A computer was used to obtain an overall summary of behavior and to compare the behavior of the most-effective foremen with the least-effective foremen. The basic statistical analysis used was the Student "t" test for the determination of significant differences between two means.

As a validity check on stability of behavior observed, the "t" test was applied to "split halves" of recorded observations. The small differences in the "split halves" indicated that sufficient samples of foremen behavior had been observed to stabilize the patterns of behavior.

As a reliability check on the regular observer, a second observer observed simultaneously with the regular observer a total of eighteen hours of foremen behavior. A "t" test comparison of these independently obtained

observations indicated a high degree of reliability for this method of studying foremen's jobs.

Significant differences were then computed on fifty behavior variables between the most-effective and the least-effective foremen. The most significant findings were as follows.

- (1) The least-effective foremen had a significantly higher activity rate.
- (2) The least-effective foremen spent significantly more time in the production aspects of the job, while the most-effective foremen spent significantly more time on personnel administration and on equipment and methods.
- (3) The least-effective foremen tended to emphasize the shorter-range aspects of the job, while the most-effective foremen had achieved a balance between the short and long-range aspects of the job.
- (4) The most-effective foremen spent significantly more time with people in carrying out the job.
- (5) The most-effective foremen and the least-effective foremen spent about the same amount of time with their employees, but the least-effective foremen had significantly more contacts with their own employees.
- (6) The most-effective foremen spent significantly more time with staff and service personnel.
- (7) The most-effective foremen showed evidence of being better communicators.
- (8) The most-effective foremen gave more general supervision and more general work orders.

Verification of these findings must await additional research efforts in other plant locations and in other types of operations.

Microfilm \$3.35; Xerox \$11.70. 257 pages.

AUTOMOBILE PHYSICAL DAMAGE INSURANCE AFFILIATES OF SALES FINANCE COMPANIES

(L. C. Card No. Mic 60-1210)

Willis Park Rokes, Ph.D.
The Ohio State University, 1959

The dissertation is a study of the automobile physical damage insurance affiliates of sales finance companies. It is limited to a special type of insurer writing primarily or exclusively the automobile fire, theft, comprehensive, and collision coverages.

The writer's objective was to examine and compile information about a little-known and much-criticized class of insurer, beginning with the initial entry into the insurance industry and tracing its development to the present time. Major emphasis was placed upon an explanation of the form of these companies, their methods of doing business, and their operating results.

The specific problem was to determine the role played by the affiliates in the insurance industry, past and present, with an attempt to forecast their future.

The research method employed both primary and secondary sources of information. The author interviewed top and intermediate management executives of several of the companies. Material was gathered from state regulatory authorities, from rating bureaus, and from insurance and business associations. Use was made of United States Senate subcommittee hearings. The foregoing was supplemented by a large amount of personal correspondence and by extensive use of library material.

The affiliates constitute a unique segment of the insurance industry. Consisting of approximately forty insurers, they write 25 per cent of the automobile physical damage insurance written by all stock companies (539 companies) and 20 per cent of such coverage of stock insurers and mutual companies combined (a total of 772 companies). Eighty per cent of affiliate business is written by eight insurers.

The typical affiliate writes only automobile physical damage insurance coverages. Its primary objective is to accommodate its affiliated sales finance company by insuring all of the automobile collateral which secures the finance transaction. The affiliate, therefore, presents the enigma of an insurer which does not underwrite its risks. As a consequence, it experiences a high loss ratio, but offsets this with low operating costs. This is largely accomplished by by-passing the insurance agent and avoiding his commissions.

While the industry as a whole has recently suffered extensive losses on automobile insurance, the affiliate has provided excellent insurance services to the public at standard rates and, at the same time, has enjoyed substantial profits. Despite this fact, some affiliates are experiencing a loss of business volume to competition.

Other problems confront the affiliates. They have been vigorously attacked because of their close connection with sales finance companies, because of their avoidance of agents' commissions, and because of their participation in a scandal involving the overcharging of policyholders to the extent of several million dollars.

In the opinion of the author, the typical affiliate is doing a commendable job of providing a highly essential service to the American public. Its survival will depend upon its ability to continue to offer quality service while at the same time meeting competition--a competition which offers all lines of insurance to the public at lower cost.

Microfilm \$3.10; Xerox \$10.80. 240 pages.

THE QUESTION OF GOVERNMENT SUBSIDY IN FEDERAL DEVELOPMENT OF THE COLUMBIA RIVER BASIN

(L. C. Card No. Mic 60-1162)

James Rodney Snitzler, Ph.D.
Columbia University, 1959

Federal development of hydroelectric power over the last twenty-five years has been the subject of much controversy. One of the major items of this controversy is the question of government subsidy. A clearer conception of this question is essential in the formulation of policy involving the nation's hydroelectric resources.

It has been charged that people in other areas such as the New England and Middle Atlantic states are forced to

subsidize the production and sale of federal power in the Southwest, the Pacific Northwest, and the Tennessee Valley.

One area of the country which provides an excellent opportunity for analyzing the validity of the subsidy charge is the Columbia River Basin, located in the Pacific Northwest. It is uniquely appropriate because it contains both federal and non-federal power enterprises. At the same time, it is the nation's greatest source of hydroelectric power, both developed and undeveloped.

The findings of the study lead to the conclusion that the Columbia River Power System is being subsidized; that the subsidy ranges from 9 to 9 1/2 per cent of the system's annual gross power revenues; and that the main source of the subsidy lies in tax exemptions. The balance of the subsidy consists of free services furnished by other federal agencies; survey costs incurred by Corps of Engineers projects prior to June 1958; and possible inflationary effects upon the general level of interest rates as a result of the issuance of securities by the U.S. Treasury to finance the federal development.

A partial offset to these subsidies is the large contribution which the power users are making to irrigation development in the region, as well as lesser contributions to flood control and navigation. Although navigation and flood control are generally considered to be of national interest, and thus the costs of their development are charged to the general treasury, federal taxpayers are spared part of the development costs of such projects in the Pacific Northwest. The Columbia River power development has also contributed heavily at the national level to defense, and to the conservation of irreplaceable supplies of coal, gas, and oil.

The benefits associated with development of the Columbia River Basin under federal leadership were found to be greater than if this development were left to local public, or private interests. This is largely because the coordinated planning and operation of a series of multiple purpose projects produces a much larger total of benefits than if these same projects were constructed and operated on an individual basis.

To permit the development of the Columbia River Basin to move forward rapidly and firmly under the leadership of the federal government it is recommended that: (1) The Bonneville Power Administration be reorganized as a federal corporation with authority to operate under a capital budget; to use its revenues for operation and maintenance; and to issue revenue bonds. (2) Local and state governments and the federal treasury finance that portion of the costs beyond the repayment ability of the water users. (3) The repayment schedules of the federal power system be placed on a depreciated cost accounting basis coinciding with the estimated service lives of the projects. (4) A reallocation of joint costs be made at the Bonneville, McNary, and Columbia Basin projects with larger shares assigned to navigation at the first two projects, and to flood control at the latter project, and (5) The Columbia River Power System make payments in lieu of taxes to state and local governments.

Microfilm \$5.55; Xerox \$19.80. 436 pages.

LEASEHOLDS—THEIR FINANCIAL CONSEQUENCES AND DISCLOSURE.

(L. C. Card No. Mic 60-952)

Roy Edward Tuttle, Ph.D.
University of Minnesota, 1959

Numerous attacks have been directed at the accounting for long-term leases and their disclosure in financial statements. This thesis presents a comprehensive summary and recommendations of accounting and disclosure practices for long-term lease accounting.

Financial and income tax policies and inflationary pressures have contributed to the development and growth of sale and lease-back transactions and to the growth of the use of leased premises. Decisions to lease are basically financial decisions.

Present accounting concepts and definitions of particular importance to the current recording and disclosure practices are presented as background to the recommended capitalization practices and essential minimum improvements. A comprehensive description of present accounting recording practices is presented. Under generally accepted accounting, the future financial consequences of an ordinary lease (other than possible costs of renovation of leased premises) are not included in the books of account or the body of the balance sheets of the lessee. Hence, current footnote disclosure practices of revealing the future financial consequences of long-term lease agreements are described and evaluated.

Most lease accounting practices were developed when leaseholds were relatively insignificant, of relatively short-term, and when there was a closeness of identity and association of business managers and owners. The separation of ownership and management and the development of long-term leaseholds as alternatives for property ownership and long-term borrowing leads to the conclusion that the financial consequences of lease agreements should be incorporated in the body of the financial statements. Consistent with the going concern concept, the definitions of assets and liabilities, and the legal interpretation of a leasehold as a valuable property right, a comprehensive accounting for leaseholds is developed.

Leaseholds are divided into three categories: sale and lease-back, lease-construction, and lease-no alternative. Sale and lease-back and lease-construction leases are defined as alternatives for property ownership and long-term borrowing. The former should be recorded as long-term borrowing of cash and an exchange of the fee for a leasehold; the latter should be recorded as an acquisition of long-term property rights and the undertaking of long-term debt. To obtain a rational and systematic allocation of the asset, the amortization of the leasehold property right must be consistent with any valuable options to renew the lease or purchase the property. Each periodic payment to the lessor should be separated into the amount representing periodic interest expense and the amount of payment of principal. Actual case materials illustrate the effect of current and proposed accounting on financial statements and footnote disclosure.

Lease-no alternative leases are those where ownership, as a practical matter, is not an alternative. The leasehold rights and the liabilities should be recorded; however, interest expense should not be imputed.

The recommended accounting enhances the value of the balance sheet and the income statement. The former includes currently omitted assets and liabilities; the latter contains a consistent functional classification of, and a more logical matching of, expenses and revenues. Footnote disclosures of long-term leases are an explanation of financial information included in the statements; under current practices, the footnote disclosures are primarily descriptions of financial consequences omitted from the balance sheet.

During the time the accounting profession and the regulatory agencies are considering, evaluating and accepting the proposed changes in lease accounting practices, two essential minimum improvements in current practice should be made: (1) a proper allocation and classification of leasehold and leasehold improvement costs to periodic income, and (2) an expansion of footnote disclosure to include all of the pertinent information of the future financial consequences of the lease.

Microfilm \$3.60; Xerox \$12.60. 278 pages.

ECONOMICS, FINANCE

PROVINCIAL-MUNICIPAL FISCAL RELATIONS AND ECONOMIC DEVELOPMENT IN A LOW-INCOME PROVINCE: NOVA SCOTIA.

(L. C. Card No. Mic 60-1138)

John Finlayson Graham, Ph.D.
Columbia University, 1959

It is the purpose of this dissertation to explain why Nova Scotia is a low-income province and to consider what pattern of provincial-municipal fiscal relations would be most conducive to the best use of its resources.

Chapters on the economic history and geography of Nova Scotia and on why Nova Scotia is a low-income province and chapters on federal-provincial fiscal relations and on municipal organization and finance in Nova Scotia provide the framework for the integrated discussion of economic development and fiscal adjustment which follows. These two aspects of the study are brought together in two chapters dealing with the effects of public services on resource allocation and with the nature of fiscal adjustment conducive to optimum resource allocation. The latter chapter is the theoretical core of the study. The principle of provincial-municipal fiscal adjustment sought, it is argued, is a modified version of the fiscal equity principle proposed by J. M. Buchanan. The modified fiscal equity principle calls for equal fiscal treatment of similarly-situated individuals in each locality of the same type (urban or rural) in the Province with respect to both benefits and burdens; for otherwise there would be pressure on the less favourably treated ones in the poorer municipalities to move themselves or their capital, or both, to where treatment is more favourable even though they may be more productive where they are.

The dissertation contains considerable discussion of the types of economic adjustment appropriate to Nova

Scotia and of the effects of transfers to poor localities on resource allocation with reference to articles by J. M. Buchanan and A. D. Scott, including a journal debate between them. The evidence suggests that there is a tendency for both labour and capital to have higher marginal productivities in other parts of the country and therefore it is likely that there will be continued migration of both factors from the Province. At the same time there is considerable room for raising average incomes by internal adjustment, especially by rationalization of primary operations in fishing, farming and forestry. It was found that in Nova Scotia raising the levels of the services in question in the poor municipalities would itself on balance have favourable effects on resource allocation.

Present provincial-municipal fiscal relations in Nova Scotia are examined with reference to the fiscal equity principle. None of the adjustment devices used by the provincial government, except the complete assumption of a municipal service, is fully in accord with the fiscal equity principle. A program of fiscal adjustment is proposed which would implement the fiscal equity principle for general services by conditional grants and for local services by unconditional grants, these grants being designed to permit all municipalities of each type to provide "foundation" or "standard" levels of services with the same burdens of taxation on property. Other proposals would give some financial relief to all municipalities. The municipalities would be left with considerable flexibility in determining the actual levels of their services for they would be free to raise the level of any service they wished, by taxing themselves more heavily, by applying their unconditional grants for the purpose, or by doing both.

Much of the analysis of fiscal adjustment and some of the recommendations are applicable to any province or state regardless of whether it has a high or low income, although in a low-income province or state both the significance of optimum resource allocation and the need for financial aid to poor municipalities are greater.

Microfilm \$5.60; Xerox \$19.80. 439 pages.

INDIA'S BALANCE OF PAYMENTS, 1920-1953.

(L. C. Card No. Mic 59-2961)

Dukh Haran Nath Gurtoo, Ph.D.
Princeton University, 1956

"India's Balance of Payments, 1920-1953" is, in part, a statistical study, and, in part, a study of the mechanism of adjustment in items in her international balance of payments to certain major disturbances discussed below.

Part One is statistical and contains four chapters. Chapter I deals with the sources, accuracy, methods of compilation, etc. of the relevant statistical series. It is noted that the present method of recording c.i.f. values of imports in India probably yields less accurate statistics than the alternative method of recording f.o.b. values. It is observed that since 1870 India has been a "mature" borrower, having surpluses on commodity exports (except for one temporary exception) that were balanced against imports of services (including those of foreign capital)

and gold; and that since 1946 the past trend of export surplus seems to have been reversed to one of overplus of commodity imports over exports. In Chapter II a close study of interest and dividend payments and receipts by India shows that the League of Nations' figures of net interest liability of India were in all probability underestimates and that they tended to show an unwarranted year-to-year stability in such payments. We have made new estimates, of India's net interest liability during inter-war years, that we think are more accurate. Chapters III and IV compile indirect and direct estimates of long-term external capital movements to and from India. The estimates reveal large discrepancies between the two kinds of estimates, which reflect partly the large conjectural element in several estimates of invisible items and partly the lack of information pertaining to the movement of funds between branches of "exchange banks" in India and their head offices (mostly) in London.

Part Two contains seven chapters. Chapter V studies the breakdown of the gold exchange standard as a result of the 1914-18 war. It analyzes the causes of the failure of the government policy to peg exchange at 2 sh. (gold) [later at 2 sh. (sterling)] during 1920. It finds the dollar-sterling rate (or cross rate) important in influencing the sterling-rupee rate at a time that the dollar alone, of these currencies, was on a gold basis. The external balance of payments on current account appeared to be an important factor affecting the sterling-rupee exchanges; speculation played a temporary role; whereas, purchasing power parity, as well as changing terms of trade affected exchanges through their effect on the balance of trade. In Chapter VI, we found that the sequence of events leading to adjustment of trade balances to capital repatriation during September 1931 to 1938, involved (1) the raising of the Imperial Bank rate of advances, (2) reduction in domestic expenditure leading to a fall in volume and value of commodity imports, (3) deterioration in the commodity terms of trade, all of which helped the adjustment process. Despite conflicting statistics of income, it appears that income adjustments did promote the adjustment of the trade balance to capital repatriation. Chapter VII makes computations of the average length of the inter-war cycles of nine items in India's balance of payments. It finds partial corroboration of the Bloomfield-Malach hypothesis that the "relative strength of cyclical fluctuations . . . appears to be the dominant factor determining the direction of capital movements." In Chapter VIII it is estimated that the separation of Burma had meant to India a loss of about Rs. 250 million of favorable trade balance. In Chapter IX, we find that as a result of Indo-Pakistan partition, India was converted into a semi-manufacturing country as far as foreign trade was concerned; and that the externalization of the branches of the Indian insurance and banking companies in Pakistan was reflected in an increase of external invisible earnings in post-partitioned India. It was also observed that increased governmental interference in international trade (e.g., import licensing, export quotas, exchange controls, discriminatory trade practices, etc.) has widened the gulf between interregional and international trade. In Chapter X, we find that rupee devaluation in September 1949 had both short-run inflationary effects and effects on the distribution of income. In Chapter XI, we find that, if we do not take into account the level of internal economic activity, during the pre-independence period (i.e., before August 1947), India's

economy had certain features, viz., the link of her currency to her variable sterling reserves in the ratio of 5 to 2, a laissez-faire policy characterized by lack of governmental interest in full employment or economic growth, downward flexibility of wage rates due to tardy growth of trade unionism, the concentration of foreign capital in export industries, like tea and jute plantations, and mining, that tended to help the smooth adjustment of the trade balance to balance-of-payments disturbances, and that some of these helpful features have ceased either to exist at all or to work effectively in the post-independence period. Microfilm \$4.95; Xerox \$17.55. 388 pages.

THE TAX TREATMENT OF FAMILY INCOME

(L. C. Card No. Mic 60-996)

Reed Robert Hansen, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Harold M. Groves

This study investigates the sales and income taxes to determine how relative tax burdens vary among families of different size, income, race, and location.

Extensive budget studies are utilized to compute the relative sales tax burdens among families to test whether empirical evidence supports the contention that the sales tax burdens decrease with a rise in incomes, increase directly with family size, and vary widely even among families of seemingly identical characteristics. The budget studies also provide a means of estimating relative family costs of living among the various family types, thereby providing a means of evaluating the adequacy of the present level of income tax exemptions and also the equity aspects of different patterns of exemptions.

A theoretical model is developed which states that relative sales tax rates are a function of the respective average propensities to consume and the ratio of taxable spending to total spending. The model predicts regressivity and perversity in the sales tax by showing how these factors vary with family characteristics.

By applying a "typical" two percent retail sales tax to the family budget studies empirical evidence is developed supporting the position that the tax is regressive, perverse, and capricious. For instance, the study reveals rates varying from approximately five per cent for the low incomes to less than one per cent for the high incomes. Furthermore, within each family size, and under specific conditions the rate differentials between low and high incomes can be as high as twenty percentage points.

In addition, the effective sales tax rate increases directly with family size. Among low incomes this tax differential can be as high as ten percentage points. Inequities are also found among families whose characteristics are usually considered identical for tax purposes. Families having the same incomes, savings, and expenditures might conceivably experience tax differentials of three to one. Tax inequities may also exist between rural and urban families, and between low income white and colored families.

A food exemption contributes significantly to a reduction in regressivity and perversity at all income levels.

However, the problems still exist among the extreme income groupings. An extension of the tax base also reduces regressivity, but to a smaller degree. Rate increases do not change regressivity, but they do change the importance of the problem. Acute revenue needs should be met either by a rate increase or base extension, but not by a tax on food.

Equity in the income tax is facilitated by using the family income as the unit of taxation rather than the individual income. This procedure would close loopholes, relieve administrative pressures, and mitigate the discrimination between salary income and divisible property income. The budget studies reveal decreasing unit costs for families of increasing size, thereby suggesting that income taxes having a fixed per capita exemption favor larger families at the expense of smaller families. Equity dictates a pattern of exemptions more closely tailored to relative family costs. A conservative pattern of exemptions which parallel relative family costs would be a \$600 exemption for a single person, \$1,200 for the married couple, and \$300 for each dependent. If additional revenue is needed and if it is desirable to correct tax inequities among family sizes even further, the results of this study would support the reduction of dependent exemptions to \$150, leaving other exemptions the same.

Microfilm \$2.95; Xerox \$10.15. 225 pages.

THEORIES OF INFLATION AND CONSUMER INSTALMENT CREDIT

(L. C. Card No. Mic 60-1191)

John Raymond Kreidle, Ph.D.
The Ohio State University, 1959

The rapid increase in instalment credit since the end of World War II, and especially during 1955, has been of major concern because it was thought that this credit contributes to economic instability. The primary purpose of this study is to investigate the inflationary characteristics of consumer instalment credit.

A historical review of consumer credit theories shows that economists have not reached a general agreement on these theories. Moreover, economists do not agree on the exact nature and causes of inflation.

This study examines first the economics of inflation. Economic theories are based on several assumptions. In one, known as the monetary theory, it is assumed that a change in the quantity of money is the primary cause of inflation; but, since the volume of trade and the velocity of money are assumed to be constant, the validity of the quantity theory is subject to serious criticism. Another theory attributes changes in the price level to changes in the total volume of spending for consumption and investment. Wage increases in excess of productivity gains tend to push up prices.

The second objective of this investigation is to establish the role of instalment credit in the economy. Analysis is made of the nature, meaning, and function of instalment credit; the nature and type of goods purchased; and the institutions engaged in making instalment loans. It was found that the demand for instalment credit service is a derived demand, based on the desire for high-priced

durable goods which cannot be bought easily from current income. The supply of instalment credit comes from the funds flowing into consumer credit institutions in the form of savings and bank credit. Instalment credit statistics, analyzed in relation to measures of economic activity and the over-all debt structure, show the growth and importance of instalment credit.

Third, the study analyzes instalment credit as an inflationary force. Theories of inflation are examined with respect to the relation of instalment credit to aggregate demand as well as to the relationship of consumers' spending and income. On the one hand, an expansion of instalment credit may have inflationary effects, depending upon whether total spending is higher than it would be without such credit. On the other hand, an expansion of instalment credit favorably affects economic activity if it encourages increased production of durable goods, since many industries that rely on credit are subject to decreasing costs, and important economies are obtainable from an expansion of their output. An examination into the actual inflationary developments in the United States during the period 1929 to 1958 reveals that large government expenditures and wage increases have been responsible for most of the inflationary movements.

It is concluded that the influence of instalment credit on the price level depends upon its effects on aggregate demand as well as on aggregate supply. It appears that in the long run, instalment credit has increased supply, resulting in mass production, mass distribution, and in lower prices. The use of instalment credit has also changed the structure of consumer demand by increasing the demand for automobiles and major household goods while lessening demand for many other commercially produced products and services. Finally, it is concluded that instalment credit is not a major cause of inflation; therefore, direct control of the amount of such credit granted per se, as a curb on inflation, is not necessary.

Microfilm \$4.05; Xerox \$14.20. 313 pages.

LOCAL SALES TAXES IN THE UNITED STATES AND CANADA

(L. C. Card No. Mic 60-835)

Weyland Douglas Poe, Ph.D.
Indiana University, 1959

Local sales taxes in the United States and Canada are a post-World War II phenomenon. Prior to 1945 only New York, New Orleans and a few cities in Quebec imposed sales taxes. Now more than 1700 cities, 74 counties, 117 school districts and one public utility district impose sales taxes at rates which vary from 1/16% to 3%. This relatively rapid spread of a new method of taxation can be attributed to (1) explosive urban growth, (2) post-war inflation, (3) resistance to further increases in property tax rates, and (4) demands for more and better public services.

The sales tax has become a major source of revenue for those cities which employ it. The average sales tax city gets one fourth of its tax revenue and one sixth of its total revenue from this source. Only the property tax furnishes more revenue for U. S. cities.

Sales taxes are being successfully administered at the local level by more than 100 city, county and school governments. However, the advantages of state administration are great, and the tax has spread much more rapidly in those states which offer to administer the local sales taxes in conjunction with the state sales tax.

While the sales tax purports to be a tax on consumption, it typically fails to cover services and many other consumer purchases, while taxing many sales of producers' goods. A few exemptions are made for the purpose of simplifying administration, but most exemptions complicate administration. At the same time they increase evasion, introduce discrimination, and make higher rates necessary. It is hard to justify the exclusion or exemption of any consumer expenditures from sales tax liability except to simplify administration or to reduce the regressive tendencies inherent in general consumption taxes.

Incidence of the sales tax is commonly assumed to rest on the consumer. However, analysis of the effects of the tax in an open economy indicates that a part of the burden is sometimes shifted backward to the owners of immobile resources which are specialized in the production of goods with elastic demand schedules.

A general sales tax which includes most subsistence items but excludes services is regressive to income, as income is usually defined. However, this regressivity can be reduced by including services in the base, eliminated by exempting subsistence items, and reversed by the use of personal exemptions. The only other highly productive taxes which have proven themselves adaptable to local use are the property tax and the flat rate, earned income tax. Studies indicate that these taxes are even more regressive than the typical local sales tax. Studies also indicate that although state and local tax systems in the United States are mildly regressive, when combined with the highly progressive federal tax system, the total tax burden is distributed progressively.

In view of the probability that local governments will continue to face demands for rapidly increasing expenditures, and of their inability to increase their other sources of revenue fast enough to meet these demands, and of the visible success of local sales taxes in easing the financial strain on nearly 2000 local governments in the United States and Canada, it seems likely that this tax will soon become quite common. And in view of the several advantages which central administration has over local administration, it seems likely that the tax will most often be administered by the state after imposition by the local governments. Microfilm \$3.65; Xerox \$17.35. 284 pages.

ECONOMICS, HISTORY

A STUDY OF THE TREATMENT OF
LABOR UNIONS AND LABOR UNION ACTIVITIES
IN SELECTED AMERICAN NOVELS PUBLISHED
BETWEEN 1891 AND 1910

(L. C. Card No. Mic 60-1087)

George Glenn Dawson, Ph.D.
New York University, 1959

This study analyzes American novels published between 1891 and 1910 which take labor problems as their basic theme. A total of twenty-eight novels are included, and the attitudes found therein toward the workingman, union organizing activities, work stoppages, unions or workers in politics, labor violence, labor leaders, and labor unions *per se* are set forth, with emergent patterns and trends being noted. A comparison is made between accounts of historical persons, organizations, or events found in the labor novels and accounts of the same persons, organizations, or events found in a variety of non-fiction sources noted for objectivity and reliability. The significance of the novelist's deviations from fact are noted, in terms of the ways in which such deviations reveal attitudes.

The method of investigation employed in this study might prove useful to others who wish to detect evidence of bias or distortion in imaginative literature. In brief, this method consists of the noting of statements of opinion in the novels toward unions, their members, their leaders, and their activities. The statements, *per se*, are qualified in terms of their significance by the nature of the character making the statements. For example, pro-labor statements made by a villainous character are not considered as evidence of a pro-union tone in the novel, and may serve to show possible anti-union sentiments.

This study reveals evidence of a trend toward greater sympathy on the part of the novels with labor unions and with the strike as a weapon of labor. As for the 1891-1910 period as a whole, however, the study shows that the majority of labor novelists disapproved of the strike and did not find the labor union to be the best answer to the worker's problems.

A number of patterns are revealed in the expressed attitudes toward labor unions and labor union activities. For example, all novels which present an unfavorable view of the workingman or which confine expressions of sympathy to non-union workingmen express disapproval of unions and of their activities. The novels which express unequivocal approval of labor unions also approve of the strike. Only one of the novels expresses approval of violence on the part of unions or of workers. A great majority expresses some sympathy for the workingman and his problems.

This study seems to imply that the labor novels of the 1891-1910 period are worthy of the attention of the historian or teacher because they reflect a wide variety of attitudes, viewpoints, problems, and proposals regarding the labor movement of the period in which they were written. Most of the novels, however, are shown to have little value as accurate accounts of history, for no novel included in this study which deals in detail with historical events or persons is free from bias or distortion of fact.

In addition to revealing the attitudes of the novels

toward labor unions, labor union activities, and the workingman, this study shows that the labor novelists of the 1891-1910 period were concerned with other social problems of their day, such as immigration, and that they tend to reflect the dominant thinking of the period, such as the trends in American mores. These factors not directly related to the labor movement are not examined in detail, but are mentioned because they might suggest topics of study for later investigators.

The labor novels of the 1891-1910 period are shown not only to present a comprehensive view of the industrial scene of that time, but to reflect the problems, institutions, traditions, ideals, and trends of their age.

Microfilm \$4.20; Xerox \$14.65. 325 pages.

ECONOMICS, THEORY

THE DEVELOPMENT OF A CLASSIFICATION OF MARKET STRUCTURES FOR AGRICULTURE

(L. C. Card No. Mic 60-933)

Jerry McHugh Law, Ph.D.
University of Minnesota, 1959

Adviser: Willard W. Cochran

This study considers the appropriateness of the theory of pure competition in explaining the sales response of farm firms. However, it is concerned particularly with whether elements of market structure, in addition to those normally considered, may be associated generally with the sales response of farm firms.

In this study the concept of market structure is considered to involve more than the phenomena of interfirm relationships; however, the concept is considered to exclude possible influences: (1) peculiar only to the individual firm or (2) exogenous to the market group.

The analysis supports the hypothesis that the model of pure competition is generally appropriate for the explanation of the sales response of farm firms. However, additional considerations combined with the criteria of numbers and product differentiation were found to provide a more complete understanding of the sales response.

The sales response pattern of the farm firm generally is formulated during the stock period. Although the stock in possession of the farmer is fixed during the stock period it does not follow that it will be offered automatically at the prevailing market price, as though the sales response schedule were perfectly inelastic. The total market stock may be something less than the total marketable stock, because the farmer may retain a proportion of the total for use in the farm household and/or farm business. The proportion so retained may vary with product price depending upon the income and substitution effects for the farmer as a consumer-seller of the commodity. The proportion of the total marketable stock not reserved for use by the farmer (at various prices) may be defined as the basic supply function, i.e., the quantity the farmer considers as market stock at different prices.

At any given time the farmer may consider: (1) selling

the market stock or (2) holding the market stock for sale at some future date. The choice will depend upon which is greater of the following two prices: (1) current price, and (2) the highest discounted future price expected. Since the farmer operates under pure competition the current price is given. Discounted future expected prices will depend upon the farmer's price expectations and the amounts by which such expectations must be discounted. Price expectations are taken as given in the present study. Uncertainty aside, the typical discount patterns will be closely associated with the perishability of the farm product. For highly perishable commodities the economic horizon of the farm firm will be approximately zero. The sales response curve will be the firm's basic supply function and all market stock will be sold in the immediate period at the going market price. The market supply function will be the horizontal sum of the basic supply functions of all firms in the market group.

If storage is practicable, the firm may be expected to have a positive reservation price. The sales response schedule will be the firm's basic supply function above the reservation price. If the current price is below the firm's reservation price all market stock will be held for sale at a later date. The market supply function is given by the horizontal sum of the basic supply functions above prevailing reservation prices. Variation in reservation prices among firms in a market group will increase the elasticity of the market supply function. An elastic market supply function may result even though sales response curves of individual firms may be highly inelastic.

In summary, a knowledge of the income and substitution effects for the farmer as a consumer-seller and of product perishability are useful in explaining the sales response of farm firms.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

THE GREAT DESIDERATUM: THE SOVIET SEARCH FOR INDUSTRIAL EXPANSION.

(L. C. Card No. Mic 60-832)

Ivo Moravcik, Ph.D.
Indiana University, 1959

Widely accepted among the approaches to theoretical thinking about Soviet-type economies is the thesis which postulates substitution of "planners' preferences" for the consumers' sovereignty of traditional theory. This study suggests that one of the most important items in the preference scale of Soviet planners is the goal of "catching up with and overtaking the level of industrial development of the most advanced capitalist countries" - the Great Desideratum of Soviet economic policy formulated by the Fifteenth Conference of the CPSU in 1926.

During the twenties, when most Western economists were not concerned with economic development, Soviet economists devoted to this problem their best efforts. The starting point of their thinking was the Great Desideratum, but this broad programmatic statement required interpretation in the form of meaningful alternatives. An interpretation which found major support was based on the recognition of the functional relationship between economic

growth and changes in the structure of the economy. The complex of desirable structural changes was identified with "industrialization". Some Soviet economists defined industrialization as an increase in the "relative weight" of manufacturing, mining and public utilities, while others interpreted it more broadly, as applying to all sectors, including agriculture, and implying concentration of production in large-scale units, application of modern technology, specialization, standardization, and increase in real capital resources per worker.

A number of arguments for industrialization were advanced. The political arguments emphasized the strengthening of the "proletarian" social basis of Soviet society and the need of developing military power for the eventuality of armed conflict with the capitalist world. The economic arguments ranged from the thesis, based on the theory of diminishing marginal utility, that increasing welfare requires consumption of an increasing variety of goods, to the analysis of factor proportions in Soviet agriculture which revealed that the marginal productivity of labor tended to be zero.

There was general agreement that industrialization was necessary, and that the program could not be financed by capital loans from abroad, hence had to be financed by transfer of domestic resources into the industrial sector. However, opinions varied widely concerning the best way in which this could be accomplished. There are strong indications that the policy recommendations reflected differences of opinion concerning the type of society into which the USSR was to evolve, though, ostensibly, all Soviet economists accepted socialism as the established economic and social order.

In their attempts to translate the Great Desideratum into economic plans, Soviet economists turned to the formulation of a growth model. Starting with the Marxian "scheme of expanded reproduction", they developed a model which anticipated in some respects the post-Keynesian Western models of growth, though it was based on a principle of disaggregation not found in the Western schemata. On the basis of this model a "working hypothesis" of a long-range plan was formulated. Partly because of the inadequacy of the model as a tool of projection, and partly because the planners were swayed by their belief in the "inherent growth advantages of socialism over capitalism", the projections fell far from the mark. Notwithstanding this failing, Soviet thinking about economic growth in the twenties deserves attention because of its originality and because it indicates that, even in a totalitarian regime, discussion of alternatives is an indispensable accompaniment of the formulation of economic policies.

Microfilm \$3.05; Xerox \$10.60. 235 pages.

DEFAULT RISK AND THE LOAN MARKET

(L. C. Card No. Mic 60-941)

James Patrick Quirk, Ph.D.
University of Minnesota, 1959

This thesis is a theoretical investigation into the influence of default risk on the behavior patterns of borrowers and lenders, within the context of a simplified

model of the market for new loans. The primary objectives of the analysis are: (1) to examine the conceptual problems that arise in the formulation of a model of the new loans market, particularly with respect to the informational aspects of the environment of borrowers and lenders, and (2) to contrast the theory of lender behavior in the new loans market with the theory of portfolio selection appropriate for investors in the "second hand" securities.

The model of the new loans market developed for these purposes employs the simplifying assumptions of fixed amounts of equity capital held by borrowers, the restriction of the analysis to one-period unsecured notes, as well as the absence of second hand markets for notes and of liquidity constraints. Borrowers and lenders are assumed to be "rational" decision makers, their optimal strategies being dependent upon the informational assumptions employed, the nature of the payoffs considered relevant in making choices, and the kinds of preference orderings over payoffs assumed.

A detailed analysis of the operation of the new loans market is provided in the "complete information" case, under the assumptions that subjective probability distributions held by borrowers and lenders with respect to rates of return earned by borrowers are characterized by "stochastic constant returns" (i.e., the distributions are mutually independent of size of firm), and statistical independence, and that linear or quadratic measurable utility functions order preferences of lenders and borrowers with respect to income. Kalecki's "principle of increasing risk" is restated in terms of the model employed, and it is shown that the principle holds when the probability of default is positive. Under certain assumptions concerning the borrower's environment and preferences, it is shown that the existence of a determinate finite optimal size of firm implies risk aversion on the part of the borrower.

The choice by a given lender of an optimal portfolio is shown to depend, in general, upon the portfolio choices of other lenders. For the special case where a given lender is assumed to be in a state of certainty concerning the portfolio choices of other lenders, and under the assumptions of stochastic constant returns and independence, it is shown that an increase in the number of notes purchased from a given borrower increases the lender's expected income at a decreasing rate and increases the variance of the lender's income. As a consequence of these characteristics of the lender's position, it is shown that both expected income maximizing and risk averting lenders will limit the number of notes purchased from a given borrower if the price of notes is given. Diversification of note holdings by lenders with linear utility functions may thus be rationalized. It is also possible to state conditions on the utility function and the probability distribution over rates of return held by the lender that are implied by the existence of capital market imperfections, including capital rationing.

The problem of optimal portfolio choices by a lender in ignorance of the portfolio choices of other lenders is also examined. Under special simplifying assumptions, it is shown that lenders who maximize the minimum expected utility from their portfolio choices will act as if they assumed other lenders would purchase an unlimited number of notes from each borrower.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

MODELS FOR THE ANALYSIS OF CAPITAL EQUIPMENT PURCHASE POLICIES

(L. C. Card No. Mic 60-946)

Rubin Saposnik, Ph.D.
University of Minnesota, 1959

This thesis is an investigation of models that might be used to analyze alternative capital equipment purchase policies. A capital equipment purchase policy is a rule that assigns to each time period in the firm's planning horizon a quantity of capital equipment to be purchased.

Various special models for determining optimal equipment purchase rules are considered in the framework of a more general capital equipment purchase model. The optimality criterion is taken to be discounted profit maximization or its equivalent, discounted cost minimization, if it is assumed that known demand requirements must be met exactly.

A special type of purchase problem, the "replacement" problem, arises if it is assumed that each machine purchase is accompanied by a machine discard so that the number of machines is constant at each point of time. A solution to this problem consists of a set of time points at which old machines should be scrapped and replaced by new machines. The interval between any two consecutive replacement points for a given machine is called the "lifetime" of the machine. As we would expect, analysis of this problem indicates that if output is constant over time, the optimal lifetime is also constant; and, if output

shifts from one constant level to another, the optimal lifetime shifts in the opposite direction.

The general problem of determining the quantity of capital equipment to be purchased at each time point arises if it is no longer assumed that each purchase is accompanied by a discard. The model used to study the problem in this paper is a member of the class of models in which machines deteriorate through use, and in which a machine of any given age is the equivalent in production of some fraction of a new machine. In particular, the deterioration of machines in this model is measured by the cumulated operating labor that has been used on the machines.

For this more general case it is shown that the optimal capital equipment purchase policy depends only on the quantity of capital equipment on hand at the end of a finite planning horizon when the interest rate is assumed to be zero. It is shown that the desired quantity on hand at the end of the planning horizon can best be achieved by making a single purchase at the beginning. The number of machines purchased should be such that deterioration will result in the optimal final quantity.

For cases in which the horizon is infinite and the rate of interest is positive, necessary and sufficient conditions on the optimal purchase plan are derived. These conditions follow from the assumption that the machine-labor production contours have the usual convexity properties. The necessary and sufficient conditions are derived by transforming an extremization problem with respect to a function into an extremization problem with respect to a scalar. Microfilm \$2.50; Xerox \$3.00. 59 pages.

EDUCATION

EDUCATION, GENERAL

AN INVESTIGATION OF TEACHING OF CHRONOLOGY IN THE SIXTH GRADE

(L. C. Card No. Mic 60-960)

Val Earl Arnsdorf, Ph.D.
University of Minnesota, 1959

Children's understanding of concepts of chronology has been a controversial issue in the Social Studies. Research has been limited to studies of the level of children's understanding of chronology rather than the ability of children to learn concepts of chronology.

The purpose of this study was to investigate the results of learning experiences which emphasized vocabulary presentation, time-line construction, and writing autobiographies in the sixth grade social studies.

The subjects consisted of 563 sixth grade pupils enrolled in the St. Paul, Minnesota Public Schools. The schools were selected and assigned randomly to experimental and control groups.

The Lorge-Thorndike Intelligence Test, Non-Verbal Battery, Level III, scores were used to classify the subjects into three ability levels. Results of the Comprehen-

sion Test of the Gates Reading Survey were used as a control in the statistical analysis. The Iowa Every-Pupils, Test B; Basic Work-Study Skills, Advanced, Forms L and N, were used as initial and final measures of understanding of chronology. This battery included: Vocabulary of Chronology, Ordering Four Events without Dates, Ordering Two Events Without Dates, Relative Time, Ordering Four Events with Dates, and Time Absurdities.

The experimental group's instructional program consisted of a social studies unit that extended over a seven-week period. The control group received no special direction with reference to activities or course of study followed. Both groups used the same basal social studies textbook and the same amount of time in their social studies curriculum.

An approximate method of the analysis of variance and covariance was used in the analyses of the collected data. In the analysis the initial scores and reading comprehension scores were controlled separately and in combination. The significance of differences between the means of the experimental and control groups were tested. The significance of the differences were also tested between the means of the boys and girls and among the levels of intellectual ability. Interactions of sex, treatment and intellectual ability level were tested also.

Significant differences between the means of the experimental and control groups were noted on four measures of chronology. These four tests were: Vocabulary of Chronology, Relative Time, Ordering Four Events with Dates, and Time Absurdities. The differences, which may be attributed to the learning experiences, favored the experimental group with the initial scores controlled, with reading comprehension controlled, and with both the initial and reading comprehension scores were controlled.

Differences between the means of the experimental and control groups on the other two chronology tests (Ordering Four Events without Dates and Ordering Two Events without Dates) and the Basic Work-Study Skills were not significant when the initial scores were controlled.

Differences among the final means of the levels of intellectual ability consistently favored the upper ability group. However, the upper ability group entered the experiment at a higher level and continued to exceed the lower levels throughout the study. It is important to note that no one level of intelligence contributed significantly more to the differences between the means of the experimental and control groups than did the others. This would indicate that the learning experiences were helpful to children at each of the three levels of intelligence.

Differences attributed to sex consistently appeared on one measure, Ordering Two Events without Dates. Sex differences on the other measures of chronology were not significant.

Interactions of sex, treatment, and level of intellectual ability were noted on the test, Ordering Two Events without Dates. These interactions indicated the boys were contributing significantly to the mean differences on this measure.

No significant interactions were noted for the other six measures. This would indicate that no one level of intellectual capacity, or one sex, or combination of sex and intellectual ability contributed significantly to the differences found between the means of experimental and control groups on the six measures.

The instructional program emphasizing vocabulary presentation, time-line construction, and writing autobiographies assisted the pupils in comprehending definite and indefinite time terms. The experimental group improved in their ability to recognize the similarity of time distances between periods with reference to other events and also to recognize time absurdities or inconsistencies.

The learning experiences contributed to the students' ability to order events accompanied by dates, but had no significant effect on the students' ability to order events without dates. When the number of events without dates was limited to two events, the boys responded to the instructional program with greater success.

Children at the sixth grade level, and perhaps lower grade levels, may be helped in their understanding of several measures of chronology. An instructional program emphasizing the specific vocabulary of social studies, construction of time-lines, and writing autobiographies fosters growth and understanding of time concepts in addition to continued growth in basic work-study skills. However, the complexities involved in developing a sense of chronology impose limitations upon the students of this grade level. Through an awareness of the difficulties involved, materials and methods for the social studies curriculum may be adapted to meet the

varying capacities of children in the comprehension of social studies concepts.

Microfilm \$2.50; Xerox \$7.60. 162 pages.

PUBLIC RELATIONS IN STATE COLLEGES FOR TEACHER EDUCATION IN THE UNITED STATES

(L. C. Card No. Mic 60-1057)

Henry Luther Bagley, Ed.D.
University of Colorado, 1959

Supervisor: Professor Homer P. Rainey

This study was undertaken (a) to discover the current programs of public relations used by state colleges for teacher education, (b) to study forces underlying such public relations programs, (c) to formulate an analysis of trends in such college public relations, (d) to set forth a group of basic principles of college public relations as revealed in present practices, (e) to set forth criteria for evaluating these public relations programs, (f) to determine the role and status of the college public relations officer in these colleges today, (g) to make recommendations concerning present practices, to show practices most commonly used, and (h) to suggest further studies in this field.

Public relations policies and procedures were examined in the light of (a) philosophy of public relations held both by college president and public relations officer, (b) status of the public relations officer and scope of his duties, (c) policies and practices underlying present college public relations programs, (d) cooperation and support given the public relations officer, (e) his professional and academic qualifications, (f) public relations problems and proposed solutions regarding the campus (student) newspaper, and (g) suggestions by public relations officers and presidents for improving present college programs and professional association's services.

Procedures used in this study involved an extensive review of literature in the field of public relations for higher education and of the broader field of higher education itself. In addition, procedures involved the development and distribution of separate questionnaires for president and public relations officer of state colleges for teacher education. Altogether, 190 of a total of 222 state colleges in the membership of the American Association of Colleges for Teacher Education filled in and returned questionnaires.

The purposes both of the president's questionnaire and that of the public relations officer are stated above. Criteria for evaluating responses from the questionnaires were furnished by six "experts" in higher educational public relations--five of whom supplied criteria for a similar study by Alton O'Brien of Columbia University in 1949-1950. These public relations authorities were Edward Bernays, Benjamin Fine, Stewart Harral, Christopher Persons, W. Emerson Reck, and Clarence Schoenfeld.

Research evidence indicated that (a) the findings of Bernays in his survey of 1948 to determine the philosophy of college presidents were completely reversed, (b) college

presidents felt that the title of their officer should be "Director of Public Relations," and almost a majority of public relations officers desired vice-presidential status, (c) major weaknesses of present college public relations programs included inadequately trained personnel, lack of finances, and lack of administrative coordination, (d) although most colleges enjoyed good relations with the campus press, the student newspaper did present continual PR problems, (e) forty-one colleges have full-time public relations officers, a gain of more than 300 per cent over the eleven reported in 1949-1950 by O'Brien, (f) a majority of presidents and public relations officers considered present programs inadequate both for the present and for the immediate future, and (g) public relations officers and presidents alike were aware of public relations problems, were attempting to solve them, and were seeking aid from their professional organizations in so doing.

On the basis of the research findings, it is recommended that (a) further public relations studies be made in privately-supported colleges, in junior colleges, and in state universities, (b) a study be made each ten years to bring up to date findings of this and previous studies, (c) state college public relations officers be given sufficient status, cooperation, and finances to improve present programs, (d) professional public relations organizations constantly improve their services to member institutions, and (e) state colleges for teacher education should constantly re-evaluate and improve their public relations.

Microfilm \$5.40; Xerox \$19.15. 424 pages.

CONSERVATION PROJECTS BY COMMUNITY ORGANIZATIONS IN TENNESSEE AND OTHER SOUTHEASTERN STATES

(L. C. Card No. Mic 60-884)

John Herbert Bailey, Ed.D.
Cornell University, 1960

Major Professor: Dr. Richard B. Fischer

The Problem: This problem grew out of the author's activity as lay secretary to the Tennessee Conservation League. This organization is composed of approximately 130 local organizations whose primary interest is in the area of wildlife resources. The league encourages the adoption of a well balanced program of conservation projects in the soil, water, forest, and wildlife resources program and in the area of conservation education. The purpose of the study was to locate, visit, and report on conservation projects carried on by groups or individuals if such project would appear to be adaptable to other conservation groups. It is felt that a proper system of communication to other organizations would help serve the cause of conservation education.

Method: Over 1800 letters were mailed in Tennessee to leaders of schools, agriculture, sportsman's clubs, garden clubs, boy scouts, 4-H clubs, F. F. A. Chapters, outdoor writers, and state wide conservation organizations. Return of a single post card was requested. Subsequent letters were mailed to professional workers of

the Game and Fish Commission, State Department of Conservation, and the Soil Conservation Service by their respective state headquarters. From these letters 121 projects were reported. Fifty-two projects were visited for a more thorough study. Eighty-seven additional letters were mailed to appropriate state agencies in eleven southeastern states. Twenty-four replies were received and 17 visits were arranged for the summer of 1958. In all visits I was accompanied by professional workers and/or lay leaders who were intimately associated with the project. An Argus C-4 35 mm. camera was used to take over 800 Kodachrome slides.

Findings: Five per-cent of the sportsman's clubs contacted reported projects of the nature sought. A larger number carry on some form of conservation education work for their own membership in the form of films and programs by professional or lay leaders.

Conservation programs of F. F. A. and 4-H groups were generally more effective than other organizations. Here is that rare combination of professional guidance, youth to provide labor and an interest of the rural land owner or operator.

Membership in most conservation organizations comes from solicitation rather than an interest in conservation.

Law enforcement personnel more frequently give active encouragement to conservation club organizations than do other professional conservation workers.

Active leadership in giving advice on conservation projects comes more frequently from the federal conservation workers than from the state agencies. This is probably because of the excess number of federal employees over the state employees.

Clubs supporting active conservation projects are able to have a larger membership fee without loss of members. People are willing to pay for what they get.

Implications and Recommendations: Conservation organizations generally represent a fair cross section of the economic and social structure in their membership. They usually are not a "rich man's club".

State agencies dealing with renewable natural resources could profitably devote a greater proportion of their educational budget to the development of conservation projects by adult groups.

Sportsman's clubs should adopt a pattern for their conservation projects and thus become recognized as a "service organization for wildlife".

Sportsman's clubs are more active in conservation efforts through legislative means than through conservation projects involving soil, water, forest, or wildlife resources. Microfilm \$2.95; Xerox \$10.35. 228 pages.

**THE EFFECT OF INTELLIGENCE ON THE
SCHOLASTIC ACHIEVEMENT OF
SIXTH-GRADE CHILDREN OF COMPARABLE
SOCIO-ECONOMIC STATUS**

(L. C. Card No. Mic 60-1242)

Robert Lee Curry, Ph.D.
The University of Oklahoma, 1960

Major Professor: Dr. William B. Ragan

The purpose of this study is to determine whether groups of sixth-grade children differing in intellectual ability achieve significantly different from one another when the groups are of comparable socio-economic status. Areas of comparison are: reading, arithmetic, language, and total achievement.

The socio-economic status of the subjects was determined and they were assigned to one of the three status groups (1) upper, (2) middle, and (3) low. Method used for determining socio-economic status is described in Intelligence and Cultural Differences by Eells and others. The subjects in the status groups were assigned to subdivisions on the basis of intellectual ability, that is, (1) upper (IQ's of 116 and above), (2) medium (IQ's in the 94-107 range), and (3) low (IQ's 85 and below). Intellectual ability was determined by use of the California Test of Mental Maturity, Elementary, 1950 S-Form.

A general hypothesis of the study is: that in the upper-, middle-, and low-socio-economic status groups there are no significant differences between the high- and medium-, high- and low-, and medium- and low-intellectual ability groups in reading, arithmetic, language, and total achievement. The general hypothesis includes thirty-six specific hypotheses tested by the "t" test using the raw score data obtained by use of the California Achievement Test. The .05 level was used to determine statistical significance.

The sample includes 360 sixth-grade students enrolled in thirty-three elementary schools in Oklahoma City who were randomly selected from a population of 2,623.

From the results of this investigation the following conclusions were made:

1. That intellectual ability has an effect upon the scholastic achievement, of sixth-grade students of the upper-socio-economic class, in reading, arithmetic, language, and total achievement. The greater one's intellectual ability is, the greater the scholastic achievement is apt to be in these areas of learning.
2. That intellectual ability has an effect upon the scholastic achievement, of sixth-grade students of the middle-socio-economic class, in reading, language, and total achievement. The greater one's intellectual ability is, the greater the scholastic achievement is apt to be in these areas of learning.
3. That intellectual ability is not a determiner of the scholastic achievement, of sixth-grade students of the middle-socio-economic class, in arithmetic. Children with medium-intellectual ability achieve as well as those with high-intellectual ability. However, those with medium-intellectual ability achieve greater than those with low-intellectual ability.
4. That intellectual ability has an effect upon the scholastic achievement, of sixth-grade students of the low-socio-economic class, in reading, arithmetic, language, and total achievement. The greater one's intel-

tual ability is, the greater the scholastic achievement is apt to be in these areas of learning.

In summary it can be concluded that in the majority of instances intellectual ability is a factor which is responsible for greater achievement regardless of the socio-economic status group to which the subject belongs.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

**THE MOTIVATIONS OF COMMUNITY LEADERS:
AN EXPLORATORY AND DESCRIPTIVE STUDY
OF THE DEVIATIONS BETWEEN THE
MOTIVATIONS OF PEOPLE WHO ASSUME
LEADERSHIP ROLES IN THE COMMUNITY,
AND THOSE MOTIVATIONS WHICH ARE USED AS
CRITERIA FOR THE SELECTION OF LEADERS.**

(L. C. Card No. Mic 59-6238)

Martin E. Danzig, Ph.D.
New York University, 1959

The Problem

The study is designed to test the hypothesis that there is a variation between two major types of motivations, those that are responsible for the acceptance of a leadership role, and those drives that urge the same person to select another for a comparable position of authority.

It is postulated that these drives for leadership-acceptance may be identified as conscious motivations. These are sub-divided into two classes, external and internal motivations.

External motivations are either incentives, in terms of the rewards that may be gained from the leadership role, or pressures that may be exerted for non-acceptance. Such pressures may be the result of fears of reprisals exerted against the person who rejects the suggested leadership position.

Internal motivations are assumed to be the satisfactions that are derived from a leadership experience. A total of eight types of satisfactions are promulgated in the study.

The inquiry assumes that there are different kinds of motivations which are involved in the selection of another person for a leadership task. A total of six major qualifications for leadership-selection are proposed.

Finally, the study hypothesizes that there is some deviation between the two major types of motivations -- those for the acceptance, and those for the selection of a person as a leader.

The Methodology

A total of fifty-one respondents, selected from six social agencies in an industrial community (Perth Amboy, N. J.), comprise the sample population for the study. The respondents are selected from lists of board members of these agencies with the help of a key person who acts as an advisor.

Four testing instruments are used in the study. They are: a leadership motivation interview guide (LMIG); a personal data record (PDR); a leadership selection checklist (LSCL); and a social participation scale (SPS). Three instruments (LMIG, PDR, and LSCL) are designed specifically for this inquiry and the fourth (SPS) is a standard scale.

A simplified procedure is followed for the conducting of the interviews. The four interview schedules have been administered in uniform fashion.

The Findings

The study reveals significant motivations for the acceptance of leadership roles. A total of eleven motivations are acknowledged as conscious desires for the assumption of leadership positions. Some of the most significant are: economic gain, desire for prestige, community welfare, conditioned circumstance, and devotion to leader.

The respondents indicate a variety of rewards and pressures as external motivations for leadership acceptance. Significant motivations identified as rewards are: satisfaction and status, while social and economic forces are the recognized pressures.

Universally, the respondents realize that there are satisfactions derived from leadership. These are internal motivations postulated in the study. The outstanding satisfactions denoted are: community welfare, expertness, achievement and status.

The second type of motivations, those involved in the selection of another person as a leader, discloses that the categories, personal characteristics and specific skills, are the two major qualifications required of a person to assume a managerial task. Chi-square tests suggest that these two motivations are significantly different from the other categories.

Correlation measures are used to test the deviation between the two major types of motivations. These tests show that no significant relationship is found.

Other pertinent findings manifest some significant reactions to the motivations of unsought leadership, crisis leadership, followership, and the frustrations experienced by leaders.

In conclusion, the study suggests a number of areas for further investigation to understand the phenomena of leadership. Microfilm \$3.85; Xerox \$13.50. 297 pages.

IMPROVING BUSINESS EDUCATION IN THE PUBLIC WHITE HIGH SCHOOLS OF KENTUCKY THROUGH SUPERVISION

(L. C. Card No. Mic 60-647)

Zebrum Slusher Dickerson, Jr., Ed.D.
University of Kentucky, 1951

The Problem

This study is an analysis of the nature, status, and current practices existing in business education in the high schools of Kentucky and recommendations for strengthening the weaknesses existing in the business education program.

Purposes of the Study

The purposes of the study are:

1. To present evidence that the high school business education program needs improvement.

2. To show that similar needs in business education have been overcome in those states providing supervision at the state level.
3. To present qualifications and duties of a state supervisor of business education.
4. To give specific recommendations for providing course offerings to meet the needs of the students and the community, for securing better qualified teachers, and for encouraging professional growth of teachers.
5. To set forth a plan for improvement of business education through state supervision.

Source and Collection of Data

Three methods of procedure were followed in assembling the primary data: the interview, the personal letter, and the questionnaire. Data from sixteen central Kentucky schools were obtained by personal interview with the business teachers in visits to the business departments.

Evidences that the High School Business Education Program Needs Improvement

Evidence of need for improvement in the Kentucky high school business education program was revealed by examination of reports of city and county superintendents to the State Superintendent of Public Instruction and by visits to sixteen central Kentucky high schools. The study revealed that there were 354 public white high schools offering one or more classes in business subjects and employing 448 teachers in the teaching of business subjects.

Weaknesses were shown to exist in curriculum, teacher personnel, and classroom facilities.

Strengthening Weaknesses in Kentucky

1. Weaknesses existing in Kentucky are not unlike those found to prevail in other states prior to the establishment of a state supervisory program of business education.
2. These weaknesses in the business education programs of Kentucky high schools can be overcome through intelligent, cooperative effort of local school teachers, administrators, teacher-training institutions, and the State Department of Education. Specific recommendations for strengthening these weaknesses were:
 - a. Increasing the number of course offerings by eliminating small classes and alternating the teaching of some business subjects.
 - b. Determining needs through community surveys.
 - c. Enlarging areas of learning to meet needs of all students.
 - d. Securing better qualified teachers through (1) cooperation of teacher-training institutions, (2) certification authorities, and (3) State Department of Education.
 - e. Encouraging professional growth of teachers.
 - f. Improving classroom conditions.

3. An effective supervisory program in the state should substantially improve the existing business education program.

4. There are three logical sources for administering a program of supervision of business education in Kentucky. These include (a) Bureau of Instruction, State Department of Education, (b) Business Education Department, University of Kentucky, and (c) Special Supervisor of Business Education, State Department of Education. Any choice would be adequate for undertaking the task.

Conclusions

The results of this study show that:

1. Business education is failing to occupy a place in the public secondary school system of Kentucky comparable with its possibilities.

2. The curriculums of the high schools of Kentucky are not broad enough to meet the existing needs of all the students. In addition, those for whom the curriculum is designed are receiving training that is too limited.

3. There is a pronounced need for improving teacher qualifications and professionalism in business education. These two areas of teacher education may be a contributing factor to the situation existing in Kentucky at present.

4. Conditions in business education similar to those existing in Kentucky have been attacked and solved in other states through proper supervision.

5. Agencies from which supervision of business education could function are available in Kentucky. Use of these agencies requires only qualified personnel and sufficient funds for performing the tasks.

6. The Kentucky Business Education Association should appoint a committee to investigate the report on the most effective ways and means whereby state supervision of business education can be organized and administered.

7. The State Department of Education should give serious consideration to the establishment of a program of state supervision of business education in the secondary schools. Microfilm \$2.50; Xerox \$8.00. 175 pages.

IDENTIFICATION OF TOOLS AND TECHNIQUES FOR THE GUIDANCE OF THE GIFTED

(L. C. Card No. Mic 60-1034)

George A. Favareau, Ed.D.
University of Colorado, 1959

Supervisor: Francis E. Clark

This research was undertaken to ascertain which tools and techniques are most effective for the guidance of the gifted. The first part of the study had to do with the use of general tools and techniques in the area of (1) identification, (2) personality evaluation, and (3) home background. The second part dealt with the extent of use of special tools. The third part explored the degree of use of methods, techniques and services. The fourth part examined opinion and consisted of two open end questions:

1. In what ways does guidance of gifted students differ from guidance of every pupil?

2. What new tools and techniques are essential or highly desirable for the guidance of the gifted?

The procedure involved the development and distribution of a questionnaire which was sent to two different groups. Members of one group, the authorities in the field of guidance, were located throughout the United States. The second group was composed mainly of counselors working in the surrounding metropolitan area of New York City, but did not include counselors in New York City. A few questionnaires were also sent to counselors in schools in other areas of the United States.

In the area of general use of tools for the identification of the gifted the four techniques greatly used by counselors and guidance authorities were (1) group tests, (2) teacher observations, (3) interviews with students, and (4) cumulative records.

Counselors and guidance authorities expressed little or no use of (1) home visitations, (2) projective tests, (3) sociometrics, and (4) controlled observations for the identification of the gifted.

The tools used extensively for personality evaluation were (1) interviews with students, and (2) teacher observations. The tools rarely used were (1) controlled observations, (2) sociometrics, (3) home visitations, and (4) group tests.

For the gathering of home background information the respondents used extensively the tools of (1) interviews with students, and (2) interviews with parents. The tools seldom used were (1) group tests, (2) sociometrics, (3) controlled observations, (4) individual tests, (5) rating scales, and (6) projective tests.

The extent of the special use of tools for the guidance of the gifted was limited. No tools were used exclusively with the gifted. The trend was to use the following tools more and differently with the gifted: (1) individual tests, (2) interviews with students, (3) interviews with parents, and (4) teacher observations.

The findings concerning the degree of use of methods, techniques and services indicated a greater use of non-directive counseling with the gifted and also of educational information.

Regrading the question as to whether guidance of the gifted involves special problem areas not as likely to be encountered by "every pupil," the respondents suggested that (1) there is a greater need for educational guidance, (2) vocational planning is more complicated because of multipotentiality, and (3) the clarification of "self concept" is especially difficult.

The new tools and techniques suggested as being essential or desirable for the guidance of the gifted were (1) use of the electroencephalograph to measure intelligence, and (2) use of the electronic maze to measure intelligence. Suggestions were made as to the need for (1) higher ceiling intelligence tests with calibrated age symbols, and (2) an instrument to measure levels of aspiration and motivation.

On the basis of the findings of this study, it is recommended that (1) guidance services be expanded into more comprehensive pupil personnel services wherever feasible, (2) greater and more effective use should be made of case conferences, (3) more experimentation is needed for developing better tools for identifying the gifted, and (4) more time should be provided for counseling.

Microfilm \$2.50; Xerox \$8.40. 182 pages.

**A SUGGESTED GUIDE TO THE USE OF PAINTINGS
AS RESOURCES IN THE SOCIAL STUDIES
FOR THE MIDDLE GRADES**

(L. C. Card No. Mic 59-6218)

Lillian Fine Fortess, Ed.D.
New York University, 1959

Chairman: Associate Professor Jesse J. Dossick

The purpose of the investigation was to develop a guide to the use of paintings as resources in the social studies for the middle grades. The significance of the problem lies in (1) the importance of paintings as primary sources for the social studies, (2) the building of a functional background of experience with paintings for the child's growth in appreciations, (3) the development of familiarity with the cultural heritage, (4) the recognition of aesthetic expression as a fundamental human activity, (5) the need of teachers and supervisors for assistance in selecting and using paintings as teaching resources in the social studies, and (6) the potentialities for child growth inherent in aesthetic experiences.

To implement the general objective, the following specific problems required solution: (1) How can paintings which have value as social-studies resources be identified? (2) How can paintings be selected in terms of their relevance to the general interests of middle-grade children in paintings? (3) How can the identified works be presented to facilitate reference by teachers and supervisors? (4) Which procedural suggestions to teachers and supervisors will offer guidance in (a) using paintings in the teaching-learning situation, (b) building school collections of reproductions of paintings, and (c) administering materials and equipment?

The scope of the guide was delimited to American paintings documenting those basic human activities known as social functions, basic processes, or areas of living within the area of the United States from 1564 to the beginning of World War II. Applicability to the teaching-learning situation in the middle grades was the central consideration.

Criteria were developed for (1) the identification of American painters whose works were to be investigated, (2) the specification of subject-matter depiction, and (3) the relatedness of the selected paintings to the researched interests of middle-grade children as a group in pictures.

Identification of 412 American painters was made and their works were examined. Of the thousands of photographs of paintings that were studied, selection was made of those that conformed to the criteria relative to children's interests and that documented social processes in the United States. An annotated tabulation of 442 paintings in collections accessible to the public and 151 paintings in private collections resulted. Paintings are presented chronologically to stress social and cultural contexts.

Selected records of teaching-learning experiences with paintings as social-studies resources are presented to illustrate the teachers' guidance role and children's responses indicative of growth potentialities. Administrative problems are considered as they relate specifically to the program, i.e., (1) building a library of color reproductions, (2) suggested materials and equipment, and (3) organizing and managing the care and use of the materials. Pupil- and teacher-participation are emphasized.

A bibliography is developed to (1) enlarge teachers' backgrounds in American painting and its role in American life and (2) provide reference materials to enrich the teaching-learning process. Since the guide purposes to be a practicable instrument, varied types of sources for painting reproductions are suggested.

The emphasis throughout the study is upon children's guided experiences, investigations, and critical thinking about man's relationships to his social and physical environments. A parallel emphasis is upon children's enjoyment of what paintings can say to them evocatively as well as referentially.

Through interactions with American paintings as documentary records, the child develops research skills and historical method leading to (1) informational discoveries, (2) problem solving, (3) insights into human relations, (4) perceptions of the continuity of human experience, and (5) grasp of developments leading to his own living environment.

Observations of children's behavior in class picture-viewing situations suggest areas for more precise hypotheses. Microfilm \$2.80; Xerox \$9.70. 214 pages.

**THE EFFECT OF A LIBRARY TRAINING PROGRAM
ON SUMMER LOSS OR GAIN
IN READING ABILITIES**

(L. C. Card No. Mic 60-968)

William R. Harmer, Ph.D.
University of Minnesota, 1959

Even though the occurrence of losses and gains in children's reading ability during summer vacation has been recognized by researchers as well as classroom teachers for many years, few attempts have been made to explain or describe these changes. The most common theory, though unsubstantiated by research, is that children simply do not engage in enough reading during vacation periods to prevent a loss from taking place. Since children's reading during the summer must usually be of a voluntary nature and since the public library becomes the most readily available source of books for children while schools are closed, it was believed that a library training program might influence the amount of recreational reading done by elementary school children during this vacation period.

The sample for this study was composed of sixteen fourth grade classes of the Minneapolis Public School System in eight Minneapolis Branch Library districts. Random methods were employed in the selection of Branch Libraries, schools, and classes within these schools. Once selected, classes were randomly assigned to an experimental or control group.

The Lorge-Thorndike Intelligence Test, Non-Verbal Battery, and Form A of the Developmental Reading Tests for the Intermediate Grades were administered to all pupils approximately two weeks before the end of the school year. The entire sample of pupils was stratified into two levels of reading ability on the basis of the total score achieved on the five sections of the Developmental Reading Test. Form B of the reading test was administered to all pupils during the first week of school in the fall.

All pupils of the experimental group participated in a ten day training period which included several visits to their Branch Library. Increased attention was focused upon recreational reading and the Branch Librarians visited each class with a collection of books that were especially appealing to children of this age.

Each set of data - pre- and post scores on the five sub-tests of reading ability, the total reading score, and the single test of intelligence - was inspected through the use of the analysis of variance and, where appropriate, the analysis of covariance. In each case, differences were sought between experimental and control groups, between High and Low Reading Groups and between sexes. Differences in interactions of any two or all three of these sources of variation were also sought. The level of significance was placed at $P_{.05}$.

No differences were found to exist on Part I - Basic Vocabulary, when the effects of pre-test differences were controlled. On Part II - Reading to Retain Information, a difference favoring the experimental group existed at the $P < .01$ level even when differences in intelligence and pre-test scores were controlled. Girls were found to be significantly better than boys ($.05 > P > .01$) on Part III - Reading to Organize, and also on the total score when the effects of differences in intelligence and in pre-test scores were removed. On Part IV - Reading to Evaluate-Interpret, no pre-test differences existed and the girls again excelled the boys at the $.05 > P > .01$ level on the post-tests. A difference on Part V - Reading to Appreciate, favoring experimental classes was found when pre-test scores were controlled. No differences, however, existed on this test when the effects of intelligence and pre-test scores were removed.

A summarization of the findings lends further support to existing evidence of the general reading superiority of girls in the elementary school. The superiority of the experimental group in reading to retain information and for appreciation indicates the importance of providing more rigorous training in the use of the library since these types of reading abilities are of particular value in the academic achievement of high school and college students and for their personal reading.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

A GUIDE FOR SCIENCE SUPERVISION IN THE NEW YORK STATE CENTRAL SCHOOL

(L. C. Card No. Mic 60-1091)

Charles Herbert Heimler, Ed.D.
New York University, 1959

The Problem

It was the purpose of this study to develop a guide for the supervision of science teaching in small New York State central schools.

The study dealt with an investigation of the present program of science education in New York State central schools having less than 400 students in grades seven to twelve and the major teaching problems encountered by the teachers of science in these schools. The study was also concerned with an investigation of the science teaching recommendations of science education specialists and

a survey of supervisory methods and techniques useful to the improvement of high school science teaching.

Methods and Procedures

A science status questionnaire form and a science teaching problem check-list questionnaire were developed by the investigator. These questionnaires were mailed to 529 science teachers employed in 249 small central schools. Questionnaires were returned by fifty-five per cent of the teachers in seventy-eight per cent of the schools. An analysis of the completed questionnaires was made for the purpose of formulating a summary of the present status of science education in these schools and to determine the teaching problems encountered by science teachers.

The study also involved the compilation, organization, and jury validation of a list of science teaching recommendations suitable and appropriate for science programs in small high schools. A final list of ninety-six science teaching recommendations was developed by the investigator.

Literature in instructional supervision was surveyed for the purpose of identifying specific supervisory methods and techniques which may be utilized in providing leadership in the improvement of science instruction. A final list of nineteen different supervisory methods and techniques validated by a jury of science specialists was prepared by the investigator.

Data collected in this study were utilized by the investigator in the preparation of a guide for the supervision of high school science teaching. The guide contains a discussion of the supervisor's role in the improvement of science education, a list of recommendations for small high school science programs, a summary of the status of science in small central schools, a list of major science teaching problems and a discussion of supervisory methods and techniques.

Summary

A study of the recommendations for high school science programs and the present status of science education in small New York State central schools indicates that there is a need for the improvement and upgrading of science programs in these schools. Opportunities for gifted science students, for laboratory work, for science project work, and for the development of local science curricula are limited.

The need for strengthening science programs is especially apparent in grades seven, eight, and nine. There is a significant lack of science demonstration and laboratory work in these grades, and a lack of adequate science facilities and equipment. Science teaching consists, in large part, of the reading, writing, and talking about science with a minimum of experience with scientific methods and science materials.

The investigation of science teaching problems indicates that the science teachers encounter numerous identifiable science teaching problems. In general, the teachers are interested in improving their teaching and express a desire for assistance in the analysis and solution of their problems.

An important outcome of this study is the guide for the supervision of science teaching. The guide provides suggestions and information which will be useful to the principal in the identification and analysis of science teaching

problems, and in the development of a supervisory plan designed to improve the local high school science program. Microfilm \$3.60; Xerox \$12.60. 279 pages.

AN ANALYSIS OF THE BUSINESS EDUCATION PROGRAM IN KENTUCKY AT THE JUNIOR COLLEGE LEVEL

(L. C. Card No. Mic 60-665)

Harry Evon Howell, Ed.D.
University of Kentucky, 1952

The primary purpose of this study is to secure information on the business education program in Kentucky at the junior college level, to evaluate the program on the basis of criteria developed in the study, and to make recommendations for the improvement of the program. The programs are evaluated in terms of the degree to which each school is meeting the needs of its individual students and of the community.

The study includes the areas of curriculum, student centered business education programs, and community centered business education programs. The three types of schools studied were the accredited junior colleges, the freshman and sophomore years of four-year institutions, and the private business colleges that have membership in the National Association and Council of Business Schools, with the exception of Bryant & Stratton Business College, Louisville.

The primary data for this study were secured from current college catalogues and through personal interviews with one business teacher from each of the colleges studied. The interviews were made by appointment.

In the early part of the study a brief historical development of business education at the junior college level is given. It was found that training for business occupations has roughly paralleled the industrial development of the United States.

The Business Education Curricula

A major part of the data regarding curricula were secured from current college catalogues and from bulletins furnished by private business colleges. The analysis of the data included total course offerings. An analysis was also made of the curricula designed by colleges for various business occupations.

Curricula for different occupations of many junior colleges and the first two years of four-year institutions appear not to provide balanced programs in business education and general education. Most of the colleges seemingly also fail to provide enough hours in electives. Three junior colleges and one four-year institution apparently fail to provide adequate citizenship training since they do not include courses in either social science, history, or government in their planned curricula for various occupational fields.

In reference to terminal business education, about one-fourth of the junior college business teachers remarked that their programs are primarily college preparatory irrespective of statements by these same teachers that only a small percentage of their graduates

pursue formal education beyond two years. Eight of the fourteen four-year institutions make no apparent provision for business training that is terminal at the end of two years.

In respect to continual curriculum revision, past and anticipated changes in business education course offerings in all types of schools do not indicate that curricula are keeping pace with business changes.

Requisites Used As Criteria

Eight requisites which were considered essential for an effective business education program were developed. Five of these requisites were used as criteria in the evaluation of the extent in which business education is student centered. Three requisites were used as criteria in the appraisal of the degree to which business education is community centered. These requisites are:

1. Coordination with levels above and below junior college is essential for planning a continuous program for each student.
2. Each school should have a guidance program based upon scientifically accumulated data.
3. Training the individual student should be a primary objective in the business education program.
4. Training should be concerned with the development of the whole student in order to attain vocational and social competence required for business occupations.
5. Each college should have an active placement program supplemented by periodic follow-up studies of graduates as a basis for evaluating the present training program and planning future programs.
6. Business teachers should solicit the cooperation of businessmen of the community and make them copartners in the responsibility for well-trained business personnel.
7. Student work experience programs should be in operation, wherever possible, in order to make business training more practical and meaningful.
8. In order to help the junior college meet its community obligations, the business department has the responsibility of furnishing leadership and services needed by the community.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

A STUDY OF CERTAIN FACTORS IN SUCCESSFUL AND UNSUCCESSFUL MARRIAGE.

(Based upon Reported Experience of Stephens College Graduates).

(L. C. Card No. Mic 60-1072)

Hugh McCammon, Ed.D.
University of Colorado, 1959

Supervisor: Professor Edwin R. Carr

The study was undertaken in the hope of increasing somewhat the insight of a staff concerned at Stephens

College with a well-established program of teaching and counseling college women before marriage. The objective was to identify the factors chiefly involved in marital success, as married women themselves identify these factors.

The instrument was a four-page questionnaire of 38 sections. Most items were upon points of objective fact; but the focus of the exploration was the section in which each woman placed her marriage on a six-level scale of rated success, then commented in explanation, without any set questions or structuring list.

The questionnaire was sent to every former student for whom a satisfactory address was available; slightly more than 20,000 were mailed. Responses sufficiently complete and clear for analysis were received from 9526.

The estimates of success are skewed upward markedly. Four in each ten women rated the marriage at the top of the scale, "far above average."

Many reservations were necessary in interpreting the data; these stem chiefly from the inherent complexities of the subject, from the non-cross-sectional nature of the sample, and from the decision not to let the instrument control the form and range of the subjective content.

The more substantial indicated conclusions include these ideas:

1. The feeling of success in marriage relates much more intensely to subjective attitudes and feelings than it does to the actual facts of experience.
2. The basis of a feeling of success is exceedingly broad. A marriage, of whatever quality, is a complex of many related factors and forces.
3. Being alike in basic ways has very much more bearing on marital success than has any other general consideration.
4. It is probable that the role of shared religion in marital success is not so great as many young people approaching marriage appear to think it.
5. There is singularly little reference to children or childlessness in explanations of maximum success.
6. Failure in marriage followed by success seems to make a woman put a very high premium on mutual respect.
7. Many considerations very important to women at the top of the scale of success do not figure large in analyses by women living in average marriages.
8. Material assistance to early marriages seems of common occurrence. It does not seem, however, to have any very significant relationship to the success of most of them.
9. Open prior resistance to a marriage seems highly related to a lessened prospect of success.
10. Exceptional success may be related to comparative chronological maturity at the time of marriage.
11. A considerable number of people in our society live in good marriages without full awareness of what makes them so.
12. A good many things that many young people before marriage believe to be of great importance to marriage do not loom large in the actual experience.

Microfilm \$2.50; Xerox \$8.40. 183 pages.

THE SUPREME COURT OF THE UNITED STATES ON RELIGION AND EDUCATION

(L. C. Card No. Mic 60-1153)

Fredric Mitchell, Ph.D.
Columbia University, 1959

This study examines the principal cases before the Supreme Court of the United States involving religion and education and spanning a century from a first case in 1844 to the eleventh in 1948. The briefs argued before the Court, pertinent social forces associated with the cases, and the opinions of legal scholars on the Court's decisions are included to set the cases in their contemporaneous backgrounds.

Part of an American tradition in the relation of church and state, formed of the ingredients of fundamental law as written in the Constitution and as interpreted by the Court, and the social pressures generated by conflicts involving religion and education, unfolds as the cases are reviewed. The doctrine of separation of church from state, embodied as law in the First Amendment of the Constitution, becomes, in the context of religion and education, an injunction prohibiting aid or hindrance of religion by state or federal agencies, including the public schools. Churches are equally prohibited in the realm of education from establishing themselves in law by gaining legal status or tax support for their educational programs and schools.

Examination of this century of cases discloses that while intrusion by government upon the free exercise of religion appears to be incidental, efforts by churches to secure aid for, and thereby to establish religion, are concerted and centrally directed. It is the latter which points to a serious conflict in America.

The main element of the conflict is the drive of two religious forces in America--some large Protestant churches and the Roman Catholic Church--to enlist the strong help of government in securing and enlarging their memberships, contrary to the injunctions of law and tradition. Lending urgency to this drive is the fact that success by the other is no part of the goal of either.

The conflict comes into focus at the point where the churches converge upon the young to train them in their beliefs and practices. For some decades the Roman Catholic Church has arrogated to itself a right to control the entire education of its member young. It has therefore set up a system of elementary and secondary schools and colleges which it presses the state to support with taxes and to which member parents are enjoined to send their children. Protestant churches, which have traditionally viewed education as separable into secular and religious parts, have long accepted and supported the pattern of secular public education in America, while relying upon churches and homes for religious training. But in recent years they have begun to urge that the public schools provide time and facilities for denominational teaching and indoctrination. Their efforts have made substantial progress in what are known as week-day, released-time religious education programs, by means of which, children, who are compelled by law to attend public schools, are released from so doing at arranged times in order to attend classes in denominational training. In this enterprise the Roman Catholic Church and, occasionally, Jewish groups have joined.

Both drives to establish religion in America--that of the Roman Catholic Church to gain legal status and tax

support for its private system of education, and the second drive, chiefly by Protestant churches, to intermingle denominational indoctrination with public schooling--have been tested in the final cases of this study before the Supreme Court and found, with qualifications, to be unconstitutional.

The drive to establish religion in America has gained considerable impetus, however, and the challenge of these religious forces to the American tradition separating religion from civil authority continues beyond the reach of this inquiry. A further examination at the focal point of religion, education, and the Supreme Court will be needed a decade or two hence, perhaps sooner.

Microfilm \$4.20; Xerox \$14.85. 326 pages.

AN ARITHMETIC PROGRAM FOR THE SUPERIOR STUDENT

(L. C. Card No. Mic 58-5848)

William Harold Mullins, Ph.D.
State University of Iowa, 1958

Chairman: Professor Herbert F. Spitzer

The purpose of this study was to develop and test one method of providing for the superior arithmetic student within the regular classroom. The investigation had the following criteria in its design. The materials that were to be used had to be horizontal rather than vertical in nature. No arithmetic usually reserved for a later grade was to be used. The materials that were developed had to be challenging and stimulating to the top twenty percent of the students, those who have been identified in this study as the superior students. The materials had to be prepared in an easy-to-use form and made self-explanatory to the students using them. The teachers participating in the investigation were urged to make the individual exercises available to anyone in the class who had the time and interest to use them. It was expected that the superior students would select themselves, thus obviating a systematic approach to the task of selecting the superior students. Since one of the objectives of the study was to discover if teachers would use enrichment materials for the superior arithmetic student if they were readily available and easy to use, no attempt was made to insist that a definite procedure be used with the enrichment materials.

The investigation was carried out in sixteen sixth-grade classrooms in three cities in eastern Iowa. Each teacher was provided with twenty-five separate enrichment lessons. There were thirty copies of the first four lessons and fifteen copies of all lessons thereafter. The teachers were also provided with a guide containing suggestions for administering the materials and a discussion of the philosophy behind the program outlined in the guide. Although suggestions were offered, the teachers were given complete freedom to use the materials in whatever way they thought best.

The study ran from February, 1958, until the end of May, 1958. At the conclusion of the investigation the teachers and students who had used the materials were given questionnaires to determine their reaction to the program. An arithmetic problems test, designed for the

study, was administered to the experimental students and a control group, obtained by matching scores on a previously-administered standardized arithmetic test. The test did not contain any problems or experiences that had been presented through the study materials. It was designed to measure differences in ability to solve difficult and new arithmetic problems. It was felt that experience with the study materials would increase the student's confidence, initiative, and aggressiveness in the face of difficult arithmetic situations and that such characteristics would enable the student to perform at a higher capacity than those without the experience of the enrichment program. All of the lessons that had been used by the students were returned, and comments regarding their difficulty and general observations by the teachers were also obtained.

The findings of the study were:

1. The lessons that were used in sufficient numbers (15) to permit evaluation of them were appropriate and successful as stimulating and challenging experiences for the superior arithmetic students in the sixth grades used in the study.
2. The reaction of the teachers and students to the materials and method was highly favorable.
3. A mean difference between the matched pairs on the test designed for the study was significant at the 5% level in one community, but not in the other two; the communities being treated separately due to organizational differences.
4. Teachers vary widely in their utilization of enrichment materials and the degree to which they adopt suggested procedures for the use of such materials.
5. Horizontal enrichment activities of this type are an effective means of providing for the superior student within the regular classroom with a minimum of effort on the part of the teacher.

Microfilm \$4.65; Xerox \$16.45. 364 pages.

THE CONTRIBUTION OF CERTAIN VARIABLES TO THE ACADEMIC ACHIEVEMENT OF GIFTED SEVENTH GRADE STUDENTS IN AN ACCELERATED GENERAL SCIENCE CURRICULUM

(L. C. Card No. Mic 60-1089)

Frederick Oakes, Jr., Ph.D.
New York University, 1959

The Problem

The purpose of this investigation was to determine the contribution of intelligence, interests, aptitudes, previous academic achievement, reading level and certain personality variables to the academic achievement of gifted seventh grade junior high school students in an accelerated general science curriculum. The specific problems in the study were:

1. To determine the coefficient of correlation (Pearson r) between the criterion and each of the variables involved in the study.

2. To determine which variables correlated significantly with the criterion.
3. To determine whether a linear relationship existed between the criterion and the significantly correlating variables.
4. To identify from among the variables for which linearity of regression had been demonstrated those which yielded a maximum coefficient of multiple correlation, R , with the criterion.
5. To compute a multiple regression equation from which the criterion could be predicted with the highest precision possible using the identified variables.

Procedure

The Read General Science Test, Form AM, the Iowa Tests of Basic Skills, the Kuder Preference Record, Form CH, the Gordon Personal Profile, the Gordon Personal Inventory, the Differential Aptitude Tests, Form A, and the California Short-Form Test of Mental Maturity were administered to fifty-two gifted seventh-grade students participating in an accelerated general science curriculum. A rating scale was also executed for each student by the sixth-grade teachers.

The criterion measure of success in the accelerated program was the Read General Science Test, Form BM. The data were treated as follows:

Using the coefficient of correlation (Pearson r), correlations between the criterion and each of the variables were obtained.

The significance of each obtained correlation coefficient was determined.

The significantly correlating variables were subjected to the F test to determine whether the criterion regressed linearly upon each of these variables.

The Wherry-Doolittle Test Selection Method was used to select the most efficacious battery of tests for predicting the criterion from among the tests that correlated significantly with, and were linearly related to, the criterion.

The multiple regression equation in score form was calculated for the tests selected by the Wherry-Doolittle Method.

Results

High scores on the criterion were associated with high scores on the Iowa Tests of Basic Skills - Composite, the Mechanical and Social Service interest scales of the Kuder Preference Record, the Verbal Reasoning, Space Relations and Mechanical Reasoning tests of the Differential Aptitude Tests and the Read General Science Test, Form AM (correlation at the .01 level of confidence) and with the California Short-Form Test of Mental Maturity - Language Factors, the Iowa Tests of Basic Skills - Reading score, the Scientific interest scale of the Kuder Preference Record and the Numerical Ability test score of the Differential Aptitude Tests (correlation at the .05 level of confidence).

The regression of the criterion on the Reading score of the Iowa Tests of Basic Skills was found to be non-linear thus eliminating this test from further consideration.

The most efficacious battery of tests for predicting success on the criterion consisted of the Read General Science Test, Form AM, the Mechanical Reasoning and the Verbal Reasoning tests of the Differential Aptitude Tests and the Mechanical interest scale of the Kuder Preference Record ($R = .7856$).

The multiple regression equation in score form is:

$$X_c = .2104X_{31} + .1598X_{20} + .3907X_{16} + .1561X_7 + 22.388$$

where X_{31} , X_{20} , X_{16} and X_7 are scores on Form AM of the Read General Science Test, the Mechanical Reasoning test and Verbal Reasoning test of the Differential Aptitude Tests and the Mechanical interest scale of the Kuder Preference Record respectively. The standard error of a criterion score predicted from the regression equation is 4.07 score points.

Microfilm \$2.50; Xerox \$5.60. 115 pages.

THE PROBLEM-SOLVING PROCESSES OF HIGH SCHOOL STUDENTS IN PHYSICS

(L. C. Card No. Mic 60-1088)

Terence Thomas O'Connor, Ph.D.
New York University, 1959

Purpose

The purpose of this study was to describe and analyze the processes of problem-solving of high school students in the physics laboratory.

Procedure

Twenty students were used as the population. They were selected from a class of one hundred and two physics students to form four groups: five students who ranked in the highest quarter of the physics class in both I.Q. ratings and A.C.E.-Q-scores; five students who ranked in the lowest quarter in both I.Q. ratings and A.C.E.-Q-scores; five students who ranked in the upper half in I.Q. ratings and in the lower half in A.C.E.-Q-scores; and five students who ranked in the lower half in I.Q. ratings and in the upper half in A.C.E.-Q-scores. The purpose of this grouping was to facilitate the comparison of patterns of problem-solving of students of similar ability.

Each student, individually, performed four laboratory problems which varied in degree of interest to the student and in degree of complexity. The interest-value was determined by the students through a forced-choice technique, and the complexity by a panel of three experienced science teachers.

The individual performances of the students in solving the problems were under the close scrutiny of the investigator. The latter recorded on a data sheet the steps of procedure and the "thinking aloud" of the students. A tape-recorder was used as an aid in recording the spoken words of the student and as a means whereby the investigator could recheck his written data.

From the recorded data, the investigator extracted the essential elements of the steps of procedure and condensed them into tables which rendered the patterns more discernible. The students' reasons for taking individual steps in the procedure were too varied to be included in the tables showing the patterns; hence, they were summarized and treated collectively in the general analyses of each problem.

Conclusions

Because of the limited size of the population and the groups used in this exploratory study, the investigator presents the following conclusions as an indication of what might be expected from similar investigations of larger groups of students:

1. Among the individual procedures of all students solving the same problem there is no common pattern, regardless of the interest or complexity of the problem.
2. Among the procedures of students of the same ability-group there is no common pattern, regardless of the interest or complexity of the problem.
3. Among the procedures of the successful problem-solvers there was no common pattern, regardless of the interest or complexity of the problem.
4. Among the procedures of the unsuccessful problem-solvers there was no common pattern, regardless of the interest or complexity of the problem.
5. The successful problem-solvers are not restricted to any particular ability-group, but are distributed among different groups.
6. The successful problem-solvers of one problem are not necessarily successful in other problems.
7. As a group, the students who rank high in both I.Q. ratings and A.C.E.-Q-scores attain a significantly higher average of correct responses than the students who rank low in both categories.

Implications

1. The selection of potential scientists on the basis of mental ability or quantitative conceptualizing is not sufficient.
2. Although successful results can be attained by various patterns, some patterns are more desirable because of their economy of time and energy.
3. The use of laboratory manuals with their uniform procedure does not engender uniformity of procedure in the students who use them.
4. The avoidance of mathematical calculations by students with sufficient training in mathematics implies a lack of confidence in applying mathematics to other fields. Microfilm \$3.85; Xerox \$13.50. 300 pages.

A STUDY OF SPECIFIC COURSE REQUIREMENTS FOR THE BACHELOR OF ARTS DEGREE IN LIBERAL ARTS COLLEGES

(L. C. Card No. Mic 60-1212)

Lucius Lee Shackson, Ph.D.
The Ohio State University, 1959

This study is concerned with the specific subject requirements for the Bachelor of Arts degree in liberal arts colleges. The writer has assumed that there is a pattern of required subjects which constitutes the essential required content of the curriculum leading to this degree. In an attempt to determine what this essential core of content might be, a set of criteria was constructed by which to evaluate the various subjects considered. These criteria have to do with the various kinds of knowledge, skills, and attitudes most closely associated with the ideal of liberal arts education.

The writer defined liberal education as a continuing process, requiring knowledge for its fruition, having wisdom as its goal, its business being primarily intellectual, its nature general and cultural. Having defined liberal education and established criteria, it became necessary to construct a list of required subjects which fitted in with the proposed definition and criteria.

The proposed list of required subjects for the Bachelor of Arts degree is as follows:

1. English skills
2. World literature
3. History of civilization
4. Science
5. Mathematics
6. Foreign language
7. Sociology and psychology
8. Fine arts
9. Philosophy and religion

The next step was to examine practice in a sampling of 222 colleges of liberal arts (by means of a catalogue study) to determine what is considered to be essential subject content by the curriculum makers in these colleges. It was assumed that this would be revealed in college catalogues. This sampling revealed a pattern of considerable conformity. Eight out of ten of the colleges sampled have requirements in science, foreign language, physical education, and social studies. More than half of the colleges sampled have requirements in Bible or religion, history, and literature.

Comparison with a previous study revealed that at the beginning of this century colleges prescribed practically all courses for a baccalaureate degree; at mid-century they prescribe in general about one-third of the courses. Foreign language, science, English, social studies, and physical education have either maintained or regained positions of importance among the requirements for the Bachelor of Arts degree in the colleges sampled. Mathematics, fine arts, philosophy, and music are slowly gaining, but hold positions of markedly less importance among the requirements for the Bachelor of Arts degree in the colleges sampled.

Comparison of the writer's proposed requirements with contemporary practice revealed that the proposal agrees substantially with general practice in the cases of English skills, science, foreign language, and Bible or religion, but not in the cases of literature, history, mathematics, sociology and psychology, fine arts, or philosophy.

The writer has set down to the best of his ability his own view of the aims and functions of the liberal arts college, finding a reasonable amount of support in some of the literature pertaining to liberal arts education. He has assumed that there is a desirable, essential core of specific subjects which should be required for the Bachelor of Arts degree, and has suggested such a core. He has found that his proposal is not in agreement with general practice in the majority of liberal arts colleges sampled, including Otterbein College.

Microfilm \$2.50; Xerox \$7.40. 159 pages.

**A COMPARATIVE STUDY OF THE ACADEMIC
ACHIEVEMENTS, INTERESTS, AND
PERSONALITY TRAITS OF ATHLETES
AND NON-ATHLETES.**

(L. C. Card No. Mic 60-1247)

Jack Harold Shirley, Ed.D.
The University of Oklahoma, 1960

Major Professor: Dr. Funston F. Gaither

The purpose of this study was to investigate the differences which existed between a group of athletes and a group of non-athletes. The study was designed to compare the athletes and non-athletes in the areas of academic achievement, personality formation and vocational interest patterns.

Six null hypotheses were formulated and tested in an attempt to answer three main questions: (1) do athletes and non-athletes differ significantly in academic achievement; (2) do athletes and non-athletes differ significantly in their responses to a battery of three personality tests; (3) is there a significant difference in the responses of the athletes and non-athletes to a vocational interest test.

To obtain the data for this experimental study, 46 male non-transfer students at the University of Oklahoma were selected which represented two equally matched groups. These two groups included 23 full-scholarship athletes and 23 non-athletes who were matched in chronological age, sex, college classification and intelligence scores obtained from the Ohio State Psychological Examination and the Iowa High School Content Examination.

The academic record of each subject was examined to determine the academic achievement of each individual in the two groups and a battery of four personality and interest tests were given. These tests were: (1) the Allport-Vernon Study of Values, (2) the Guilford-Zimmerman Temperament Survey, (3) the Minnesota Multiphasic Personality Inventory, and (4) the Strong Vocational Interest Blank for Men.

The primary statistical treatment employed in this study was the t-test for correlated data using the "difference method." The following conclusions were based upon the statistical treatment of the data obtained from the academic records and the battery of personality and interest tests:

1. There was no significant difference between the athletic and non-athletic groups on total grade-point averages.
2. The non-athletic group earned a significantly higher number of course-credit hours for three years of college.
3. The non-athletic group scored significantly higher on the Theoretical Value of the Allport-Vernon Study of Values. No significant differences were found on the other five values of the test.
4. There were no significant differences between the athletic and non-athletic groups on any of the ten personality traits on the Guilford-Zimmerman Temperament Survey.
5. The athletic group differed slightly on the Psychopathic scale of the Minnesota Multiphasic Personality Inventory. Insignificant differences were found on the other nine scales.
6. No significant differences were found between the athletic and non-athletic groups on any of the seven oc-

cupational interest scales on the Strong Vocational Interest Blank for Men. Microfilm \$2.50; Xerox \$4.40. 85 pages.

**A DETERMINATION OF CONSERVATION
PRINCIPLES AND CONCEPTS DESIRABLE FOR
USE IN THE SECONDARY SCHOOLS**

(L. C. Card No. Mic 60-312)

Halene Hatcher Visher, Ph.D.
Indiana University, 1960

The purpose of this investigation was to determine the principles and concepts of conservation desirable for use in the secondary schools, grades 7 through 14, inclusive.

A list of principles and concepts was obtained by an analysis of fifteen conservation textbooks, nine books for the general reader, two special conservation issues of journals, one reprint series, five publications of professional materials for teachers, and four doctoral dissertations.

As conservation cuts across many areas of learning, the tentative list of generalizations was submitted to eleven specialists, representing a wide range of professional training and experience in conservation.

This committee includes the former Chief of the U. S. Soil Conservation Service; the vice-chairman of the President's Water Resources Policy Commission; authors of conservation textbooks, bulletins, and teaching aids; past-presidents of the Conservation Education Association; the Assistant Commissioner for Vocational Education in the U. S. Office of Education; and other specialists in particular resources. These men checked the scientific accuracy of the statements and refined some of them.

The resulting list of principles and concepts was submitted to five nationally recognized leaders in conservation education familiar with instructional problems at the secondary level. These evaluated each statement in terms of its relative desirability for use in the secondary schools.

The approved list of 477 conservation principles and concepts constitutes the major contribution of this investigation. These generalizations include 78 classed as general or not limited to a single resource; soils include 85; water, 56; forests, 55; grasslands, 20; minerals, 57; wildlife, 51; recreation and scenic resources, 37; and human resources, 38.

Nowhere else is there such a broad, comprehensive coverage of conservation principles and concepts. This compilation, therefore, will greatly aid in implementing a broad, well-balanced program of conservation rather than the traditional, somewhat narrow, piece-meal approach to resource use.

The thirty-eight generalizations on human resources should stimulate greater demand for the wise use of the most valuable resource, and should help to make for better integration in the study of the natural and human resources in the total education program.

Moreover, the principles and concepts herein presented bring into sharper focus the significance to mankind of increasing the usefulness of all resources for the improvement of human welfare on a continuing basis. This compilation further emphasizes the contributions to

wise-use of resources that individuals can make, both in their efforts alone and in cooperation with others on a local or broader basis.

The value of this study extends beyond that of the secondary level as the generalizations herein presented are useful at other levels of learning.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

**THE PROBLEM OF VALUE IN
TECHNICAL ASSISTANCE IN EDUCATION:
THE CASE OF KOREA, 1945-1955.**

(L. C. Card No. Mic 60-1286)

Elizabeth Cecil Wilson, Ed.D.
University of Maryland, 1959

Supervisor: Professor Gladys A. Wiggin

The purpose of this study is to assist in the clearer definition of the task of technical assistance in education. Toward this end the inquiry attempts to compare and contrast the major values which dominated Korean education in 1945 with those imported by American teachers working in technical assistance programs in South Korea between 1945 and 1955.

An introductory section deals with the context, concepts, sources, and limitations of the study. Operational definitions of technical assistance, education, and value are discussed as well as the relationships between education and society and between education and value systems.

The body of the study divides itself into several historical sections, an analytical section, and a brief inquiry into the nature of technical assistance in education in Korea. The historical development of educational values in Korea is first considered. Five major value systems are seen as molding formal and informal educational institutions before 1945. Of these five, Confucianism, Buddhism, and Shamanism formed the background for traditional Korea. In the twentieth century, evangelical Christianity and mission schools were imported from the West, and Shintoism and a Japanese education system from Japan. In 1945, with varying degrees of intensity, all five value systems seemed to be evident in Korean social and educational patterns.

From 1945 to 1955 a series of American teachers came to South Korea to help in the rebuilding of the Korean education system. The history of these educational missions is reconstructed. The objectives and organizational patterns of the foreign enterprises are reviewed. In like manner, the work and methodology of the Americans are considered. American reactions and recommendations in relation to Korean culture in general, in relation to the Korean education system, and in relation to their own work are described. Recurring themes are periodically noted. At the end of the sections which deal with American educational assistance, an attempt is made to point out both consistent and inconsistent patterns of behavior and reaction, and to suggest some American operating values.

The descriptive historical material concerning Korean and American educational values is then analyzed, the instrument for analysis being a classification scheme for

value-orientations conceived by Florence Kluckhohn. Both Korean and American ways of looking at man's innate predispositions, at man's relation to nature, at time, at desirable personality characteristics, and at man's relation to other men are suggested, and later outlined in parallel form.

Since the value systems of the two cultures appear to be different in many basic ways, the study concludes with reflections on the task of technical assistance in education in Korea. Some working hypotheses are outlined and some questions raised, all of which are based upon the premise that the sharing of values, rather than the sharing of technical knowledge, is the fundamental component of the task.

Microfilm \$4.50; Xerox \$15.75. 349 pages.

**A STUDY ON INSURANCE CONTENT FOR
EXECUTIVE ACTIVITY: AN ANALYSIS AND
EVALUATION OF REQUIRED INSURANCE
COURSES IN COLLEGIATE SCHOOLS OF
BUSINESS IN RELATION TO JOB NEEDS
OF BUSINESS EXECUTIVES.**

(L. C. Card No. Mic 59-6234)

Stanley N. Young, Ed.D.
New York University, 1959

The purpose of this investigation was to determine the appropriateness of the content of the required courses in insurance for the non-insurance major, which are part of the curriculum of the collegiate school of business in relation to the job needs of the future business executive.

The investigation concerned itself only with those collegiate schools of business in which insurance instruction is mandatory for students with a field of specialization other than insurance.

The need for the study is borne out in the fact that the collegiate school of business will provide the executive of the future, who will need a good working knowledge of insurance to properly carry out his tasks. Since these schools are attempting to supply this knowledge, it is significant to determine how effectively this job is being done.

To cope with the problem, a comprehensive check list of insurance topics was constructed. The list was submitted to those collegiate schools of business which require insurance instruction of their non-insurance majors who were asked to indicate which subjects are included in this required course. The same check list was submitted to business executives and to licensed insurance brokers. The executives were asked to indicate if they had a good working knowledge of a subject and found it useful; had a good working knowledge, but not much need for it; knew little about it, but felt a better knowledge would be beneficial; or knew little about it and had little need for it. The brokers were asked to give their opinion as to whether a particular subject was vital, helpful, or unnecessary as regards information concerning it which the business executive should know. One hundred useable responses were obtained from the executives and fifty from the brokers.

To determine trouble areas which should be stressed, one hundred cases involving litigation between assureds and their insurance carriers were studied, analyzed and categorized.

The results of the study were then discussed with leading business educators and a list of insurance subjects to be included in a required course was prepared.

Some of the more significant conclusions derived from this study are as follows:

1. Schools, executives and the professional insurance man are all very cooperative in furnishing data requested and anxious for the student to receive the most beneficial type of instruction.
2. The subjects of greatest significance to the executive are automobile, fire and life insurance, which are followed closely in order of importance by liability and workmen's compensation insurance.
3. Many schools include subjects in their required course which would be needed by the executive only in specialized cases.
4. Although the majority of the cases would arise regardless of insurance knowledge or the lack thereof, certain salient points meriting emphasis become apparent.

In order to follow up the advantages derived from the study, among others, the following recommendations are offered:

1. A survey and evaluation of the insurance courses being offered should be periodically undertaken.
2. Automobile, fire and life insurance should be given very comprehensive treatment in the required course. Liability and workmen's compensation insurance should also be given fairly intensive coverage.
3. Time should not be spent on those subjects which will be of use to only a small percentage of the executives.
4. Throughout the instruction, pitfalls to be avoided should be brought out to the student. The more important of these would include the necessity for carrying high limits of liability and complying with policy conditions when a claim arises.

Microfilm \$3.30; Xerox \$11.50. 255 pages.

EDUCATION, ADMINISTRATION

AN EXPLORATORY STUDY OF THE RELATION OF EMOTIONAL NEEDS TO ACADEMIC ACHIEVEMENT

(L. C. Card No. Mic 60-1097)

Rollin Paul Baldwin, Ph.D.
New York University, 1959

Experienced classroom teachers are well acquainted with the attention-seeker, the shy girl, the aggressive boy, the poor concentrator, the slow student, the child with the

short attention span, the fidgety child, the teacher's pet; the poor mixer, and others. They often recognize, early in the school year, that many of these children seem to have persistent problems in reading, arithmetic, spelling, or writing. Try as they may, the teachers often find themselves unable to help the children to make satisfactory academic gains. The purpose of this study has been to determine if learning can be facilitated through increased attention to unmet emotional needs rather than by intensive academic drilling.

Another major purpose of the study which was conducted by a school administrator is to discover a way whereby teachers who are without the constant, full-time aid of psychiatrists and psychologists might identify and attempt to meet some of the unmet emotional needs of children within the framework of day-to-day planning, teaching, and guidance.

Implicit in this study is the assumption that there is a definite relationship between effective learning and emotional needs. It assumes that some children's educative processes are blocked by unmet emotional needs. When this occurs children are driven by such strong emotional urges that their primary concern is a pre-occupation with the satisfaction of unmet needs. Learning, as a consequence, becomes thwarted.

The hypothesis states that as teachers meet together to study children's needs and as they attempt to meet those needs identified as being unmet, the learning of the children improves and they show significant gains in the academic skills of reading and arithmetic.

The design of the study included two matched groups of ten children--the experimental group and the control group--to whom achievement tests and intelligence tests were administered at the start of the study. In addition, the children were given a test designed to identify important unmet emotional needs. No special teaching techniques were used with the control group, while the experimental group became the focus of a series of in-service meetings conducted by the investigator and including ten teachers who had close contact with the experimental children. The in-service group addressed itself to a study of the unmet emotional needs of the experimental children as identified by the tests and worked diligently to use techniques in the classroom which were designed to attempt to meet these needs. At the end of the study, a second battery of achievement and intelligence tests were administered and the results were compared with those of the first battery.

The data supported the hypothesis by indicating a statistically significant difference between gains made by the experimental group and the gains made by the control group. This support tended to substantiate the fact that there is a definite relationship between the emotional needs of children and academic achievement.

The conclusions have additional significance for two reasons: (1) This experiment was conducted in a school which, in its routine functioning, emphasized the meeting of needs. (2) The control children were in the same classroom as the experimental children and yet were not known to the teachers as being participants in the study. These two conditions lent support to an underlying generalization of the study that a pinpointing of unmet needs and a sharp continuing focus in meeting those particular needs, yield significant gains in academic achievement.

Microfilm \$2.50; Xerox \$5.80. 119 pages.

**A COMPARISON OF SCHOOL OPERATING COSTS
OF SELECTED KANSAS CITIES OF
THE SECOND CLASS; 1956-57.**

(L. C. Card No. Mic 60-895)

Roy A. Bartel, Ed.D.
University of Kansas, 1959

Supervisor: Dr. John H. Nicholson

The Problem: Current widespread interest in the costs of education justifies a study of particular regions or levels of education to supply information about what actually is occurring. "Second Class" cities in Kansas constitute a reasonably comparable group.

The central purpose of the study is to provide information with which to compare current operating costs between the 79 schools in the study, between the selected schools and other schools in other regions, between present costs and former cost figures, and to establish a benchmark for future similar studies in Kansas.

Methods Employed in the Study: "Operating Costs" in this study excludes transportation, debt service, capital outlay and supplemental services but does include commonly accepted items which make up the bulk of current school costs: general control; instruction; operation of plant, fixed charges; auxiliary agencies; and maintenance of plant.

Classification of cost items follows the forms used by the State Department of Education in Kansas and by the U.S. Office of Education in The Common Core of State Educational Information. Only elementary and secondary school units are included.

Information was gathered from the financial sections of the Annual Reports to the State Department of Education and the budget reports filed in the State Auditor's office, Topeka, Kansas. Data were arranged for each school in six categories mentioned above.

A comparison of the ten largest and ten smallest schools in the study was made to discover what differences, if any, might be found that could be attributed to school size.

Comparisons were made between schools grouped into six "economic sub-regions" of Kansas as identified by the Bureau of Business Research, University of Kansas.

Findings: There is an apparent need for more precise definitions of accounting terms used by school administrators. The state agencies responsible for collecting information have not been successful in promoting uniform accounting procedures.

There is a relationship between school size and per-pupil costs; the larger schools tending to provide a broader curriculum at a lower unit cost.

The relationship between school expenditures and differences in the "economic sub-regions" in Kansas is not apparent. School size, as mentioned above, seems to be the most important factor.

Conclusions: Data collected and arranged for schools of comparable size or legal structure can be a value in comparison between schools, to give precise information regarding trends in school costs, and to provide a benchmark for future studies.

Uniform accounting procedures will have to be promoted by the state agencies responsible for collecting information. In-service education activities for school administrators seem to be the best means for improvement in the near future.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

**A STUDY OF TEACHERS' ROLE-EXPECTATIONS
AND ROLE-PERCEPTIONS OF A PRINCIPAL,
SUPERINTENDENT AND BOARD OF EDUCATION,
AND THE RELATIONSHIP BETWEEN
CONVERGENCE AND DIVERGENCE OF
ROLE-EXPECTATION AND ROLE-PERCEPTION
AND TEACHER MORALE.**

(L. C. Card No. Mic 60-1107)

Mildred Ruth Henrich Bernstein, Ph.D.
New York University, 1959

The Problem

This study aimed to discover the patterns, if any, of senior high, junior high, and elementary school teachers' role-expectations of a principal, a superintendent, and a board of education and the teachers' role-perceptions of these administrators. It also explored the relationship between teachers' perceptions of principal performance and their morale status and teachers' perceptions of board of education performance and teacher morale.

The study was initiated upon the assumption that the school is a social organization comprised of various inter-related groups which are expected to function according to roles accorded to their positions.

Procedure

Incomplete sentences and opinionaire items were utilized to elicit role-expectations and role-perceptions. Teacher morale status was measured by an opinionaire consisting of 100 items devised by a research seminar group over a period of two years.

Three instruments were administered to a suburban school system which consisted of one senior high, one junior high, and nine elementary schools. Of the 282 teachers in the school system, an average of 80 per cent responded to the instruments.

The role-expectations were analyzed according to whether personal (teacher-directed), impersonal (school-directed), or a combination of personal and impersonal behavior was desired. The role-perceptions were tabulated mainly as positive, negative, or neutral. An attitude-toward-principal score, an attitude-toward-board of education score, and the Morale Tendency Score were determined for each teacher. Rank order correlation coefficients were calculated. Four groups of teachers were selected according to whether their expectations of a principal were perceived as being fulfilled or as not being fulfilled, and whether role-expectations of a board of education were being fulfilled or not. The median Morale Tendency Scores of the "satisfied" and "unsatisfied" groups were compared.

Chi square, the *t* test, the *z* transformation procedure, and the median test were utilized to determine statistical

significance. The data was presented in table form. Examples of teachers' expectations and perceptions were given as these were expressed by the teachers.

Results

1. Although the teachers appreciated the "administrative" obligations of the administrators, they stressed the personalized human relation aspect at all administrative levels, but particularly for the positions of principal and superintendent. They expected the board of education to be concerned with the over-all educational scene.

2. There were suggestions of some differences in role-expectations for the three teaching levels, the junior and senior high school teachers tending to think of a principal and a superintendent in a less personal way than the elementary school teachers.

3. The teachers' perceptions of principals tended to be favorable, of superintendents equivocal, and of boards of education favorable except for board members' tendencies to be influenced by community officials and pressure groups.

4. There was a strong positive relationship between teachers' perceptions of the principal and their morale status and between teachers' perceptions of the board of education and their morale status.

5. Convergence of role-expectation and role-perception of a principal and of a board of education were associated with high morale. Divergence of role-expectation and role-perception of these administrators were associated with low morale.

6. Convergence and divergence of expectations and perceptions of a principal appeared to have a greater influence on the morale status of a school than convergence and divergence with respect to a board of education.

Implications and recommendations for teacher and administrator training as well as for approaches to approximate harmony between role-expectations, role-performance, and role-perceptions were suggested.

Microfilm \$2.60; Xerox \$9.00. 199 pages.

AN ANALYSIS OF SUPERVISED STUDENT TEACHING IN KENTUCKY

(L. C. Card No. Mic 60-634)

Taft Benjamin Botner, Ed.D.
University of Kentucky, 1950

Purposes of the Study

The purposes of this study are threefold: (1) to determine the nature and general status of the supervised student teaching practices in Kentucky; (2) to analyse current practices in terms of generally accepted principles of a good program of supervised student teaching; and (3) to suggest possible action by teacher education institutions, the Council on Public Higher Education, and the State Board of Education for the improvement of supervised student teaching programs in the state.

Procedure and Sources of Data

The major part of the data has been collected by questionnaire; however, the writer visited a number of the teacher-education institutions in the state and interviewed persons responsible for the supervised student teaching programs, supervising teachers, and student teachers.

Scope of the Study

This study is limited to student teaching as defined by the American Association of Colleges for Teacher Education:

Student teaching is a period of guided teaching when the student takes increasing responsibility for guiding the school experiences of a given group of learners over a period of consecutive weeks.¹

No attempt is made in this study to survey or analyse laboratory experiences prior to or following student teaching.

Recommendations

On the basis of the findings in this study, and the evaluation of present practices in teacher-education institutions in Kentucky, recommendations relating to the following aspects of student teaching are made: (1) the place of student teaching in the total teacher-education program, (2) the length and scope of the student teaching experience, (3) laboratory facilities, (4) the selection of student teachers, (5) the supervising teacher, and (6) needed study. Some of the recommendations are given below.

1. The Place of Student Teaching in the Total Teacher-Education Program. It is recommended that:

- a. Student teaching experiences be planned and carried out as an integral part of the total teacher-education program.
- b. All persons concerned in the education of teachers participate in planning student teaching experiences.

2. The Length and Scope of the Student Teaching Experience. It is recommended that:

- a. A period of full-time student teaching of not less than twelve weeks be provided all student teachers.
- b. Adjustments be made within the student teaching experience to meet the needs of individual student teachers.

3. Laboratory Facilities. It is recommended that:

- a. Each institution arrange for laboratory facilities sufficiently extensive to provide for each student teacher, as near as possible, the full experience of the in-service teacher.
- b. Off-campus laboratory facilities be greatly extended.

- c. Campus training schools be used more extensively throughout the period of teacher training for laboratory experiences prior to student teaching, and off-campus situations for student teaching.
4. **Selection of Student Teachers.** It is recommended that the following minimum standards for admission to student teaching be set by the State Board of Education:
 - a. A general scholastic standing of not less than 1.25.
 - b. For secondary majors, a scholastic standing of 1.5 in any subject or area in which student teaching is done.
 - c. A continuation of the State Board of Education regulation requiring the completion of 90 semester hours of required work.
 - d. A continuation of the State Board of Education regulation requiring the completion of 16 semester hours in any secondary subject in which a teacher does student teaching.
5. **Supervising Teacher.** It is recommended that:
 - a. The State Board of Education require a course in supervision of student teaching for the Standard Critic Commission.
 - b. The program of in-service training -- workshops and conferences by the College of Education, University of Kentucky, be continued and expanded.
 - c. Each teacher-education institution maintain an in-service training program for its supervising teachers.
6. **Needed Studies.** Findings in this study emphasize the need for a study to determine Criteria for the admission of students to student teaching, and a study to determine an equitable and satisfactory system of supplementing the salaries of off-campus supervising teachers.
Microfilm \$3.95; Xerox \$5.40. 307 pages.
1. **Recommended Standards Governing Professional Laboratory Experiences and Student Teaching and Evaluative Criteria.** American Association of colleges for Teacher Education, 1949, p. 4.

**A STUDY OF THE RELATIONSHIP OF
MERIT SALARY SCHEDULES TO THE
MORALE OF THE TEACHING STAFF IN
ELEVEN SELECTED SCHOOL SYSTEMS**

(L. C. Card No. Mic 60-1122)

Henry Townsend Carpenter, Ed.D.
New York University, 1959

The application of the merit principle to teachers' salaries has been, and still is, a source of controversy in both professional and lay groups.

It was the purpose of this investigation to determine if there was a difference in the morale status of the teaching staff in school systems that used the merit principle as part of the salary schedule and in school systems that did not use the merit principle as part of the salary schedule.

The merit pay system for teachers is not new. One of the earliest records shows that the first teacher in Northampton, Mass., in 1644, was on merit. Early literature dealt with the judgments of supervisors as determinants in fixing salaries according to the merit of the teacher. Later evolved the position-type schedule, then the single salary scale using the preparation-experience method of fixing salary. In 1947, the New York State Legislature enacted into law for the first time in this country a merit pay scale for teachers. In recent years a tremendous amount of material has been written, both pro and con, about merit pay for teachers.

Eleven school systems were selected to participate in this study. Five of these were using merit salary schedules and six were not using merit salary schedules. As near as possible those schools not using merit were comparable to those using merit. Each faculty member was asked to complete three Teacher Personnel Inquiries and to return them, in a sealed envelope to New York University. The scoring of these research instruments yielded the Morale Tendency Scores for both individual teachers and school systems.

The mean scores for the different types of school systems, different groups of teachers within systems, as well as scores of individual teachers in different systems were compared to see if merit salaries had any effect upon the morale tendency of teachers. Teacher attitudes toward the single salary scale, rewards for meritorious teaching, the merit principle in operation and non-monetary rewards for outstanding teaching were recorded and studied.

In all cases but one, the majority of the faculties were willing to participate in the study. 1336 responses, out of a possible 1770, were gathered for a response percentage of 75%.

The data gathered were divided into five sub-sections. They were Merit and: the Morale of School Systems; Its Effect Upon Teacher Relations; Its Effect Upon Morale Factors: Rewards For Meritorious Teaching; and Morale and the Administration of Merit Awards. A study of the data indicated that the following conclusions could be drawn:

1. That not all teachers are opposed to a merit rating system.
2. Teachers in systems where merit rating is a co-operative matter, are more in favor of it and have higher morale than teachers in systems where merit rating has been imposed.
3. Teachers are not in agreement as to how to reward meritorious teaching; the majority favor non-monetary rewards.
4. Teachers recognize and accept the leadership of colleagues regardless of whether these colleagues are rated meritorious or not.
5. The merit salary principle, by itself, does not lower the morale of the faculty or necessarily create barriers between teachers and/or administrators. However, neither does it appear to make any positive contribution to raising faculty morale.

The most important conclusion seemed to be that the merit principle could not be evaluated by itself. It must be recognized as only one aspect of the many factors which affect morale and that it is only one aspect of personnel policy and practice in a school system. It may be that merit has become the emotional "scapegoat" for other poor personnel policies and practices.

Microfilm \$2.50; Xerox \$8.60. 190 pages.

SCHOOL ADMINISTRATION PROBLEMS AND PRACTICES IN HIGH SCHOOL INTERSCHOLASTIC ATHLETICS IN CALIFORNIA

(L. C. Card No. Mic 60-556)

Ray Patrick Charlson, Ed.D.
University of Southern California, 1960

Chairman: Professor LaFranchi

The purposes of the study were to analyze school administration problems related to interscholastic athletics in California high schools and to appraise administrative policies and practices designed to meet these problems.

The study was limited to three- and four-year high schools which averaged no less than two hundred students per grade.

A survey questionnaire was sent to an administrator and physical educator in each of ninety-nine California high schools, randomly selected within seven regional areas. Return of usable questionnaires was 83.8 per cent. From survey results, problems ranked highest on basis of frequency and intensity were selected for further study. Forty-four regionally selected California high schools and related literature and research were studied intensively to learn of policies and practices designed to meet the main problems identified by survey. The two phases of the study were done between December 1957 and July 1958.

Findings. Main problem areas were (1) interference with school and class programs, too many contests, and loss of class time by athletes; (2) negative effect on boys' physical education and lack of intramurals due to emphasis on athletics; (3) financing athletics, costs to individual athletes, insurance for athletics, clerical needs for athletics, and team transportation; (4) extra pay for coaches, faculty supervision at contests, and little participation by coaches in faculty activities; (5) night athletic events, behavior and control of nonschool spectators, and poor officiating; (6) lack of adequate facilities and preparation of facilities for athletic events.

The study presents seventy-one suggested solutions to the above problems. The following five, in summarized form, are representative of the findings in this respect:

- (1) Have general and specific written athletic policies.
- (2) The chairman of physical education and a majority of its instructors should not be assigned to athletic coaching.
- (3) Intramurals should have administrative backing which ensures strong leadership, planning, and adequate time, personnel, facilities, and equipment.
- (4) Daily practice in athletics should not exceed two hours.
- (5) Extra compensation should be given for supervision duties at night athletic events and when considerable time, special ability, or actions remote from the role of the teacher are required.

Conclusions. (1) Athletics receive higher priority and

more attention than any other extracurricular activity.

- (2) The athletic program has wide scope and participation in most schools.
- (3) The health and safety practices are very adequate.
- (4) The California Interscholastic Federation is highly regarded by its member schools.
- (5) There is a trend toward increased school district financial support for athletics.
- (6) Large city districts have the more conservative athletic programs.
- (7) There was a more frequent identification of athletic problems by administrators in medium-size high schools than in large high schools, but for physical educators the reverse was indicated.
- (8) There appears to be less planning and concern for basic educational values in athletics than for aspects of promotion, performance, and exhibition.
- (9) Many athletic facilities predate the present extensive student and community interest in athletics.
- (10) Clarification of proper financial charges against the athletic program would improve its budgeting and financial procedures.
- (11) Written athletic policies are helpful and are needed in many schools.
- (12) The interrelatedness of interscholastic athletics makes difficult the changes in the program desired by individual schools.

Recommendations. (1) Findings of the study should be used for upgrading interscholastic athletics. (2) A state-wide committee, representative of secondary education and athletics, should study the athletic program in California high schools and develop criteria for the program. (3) Legislation should be enacted making it mandatory that school districts finance basic costs of school athletics. (4) School administration training should include more information on educational values and objectives of interscholastic athletics.

Microfilm \$6.90; Xerox \$24.55. 542 pages.

A SURVEY OF PRACTICES IN SELECTED SCHOOL DISTRICTS IN KANSAS PERTAINING TO CERTAIN PROBLEMS ASSOCIATED WITH SCHOOL BUILDING CONSTRUCTION

(L. C. Card No. Mic 60-897)

Christ Alex Christ, Ed.D.
University of Kansas, 1959

Supervisor: Dr. John H. Nicholson

The problems of school building construction are being met daily by school administrators and boards of education over the nation. Many of them are not prepared to meet the problems effectively. Obsolescence of present school plant, increasing birth rates, redistribution of the population, expansion of school services and increasing social pressures to attend school longer have all contributed to the present rapid pace of school building construction.

Statement of the Problem:

The purpose of this study was to assemble pertinent information from the literature and research on the topic, survey current practices of experienced school administrators in Kansas and make a comparison between

commonly accepted viewpoints expressed by writers in the field and practices revealed by the survey.

The problem had a personal and immediate value to the writer and may be of value to other school administrators facing similar problems.

Procedures:

The first step in the study was an extended review of writings on the subject. Areas of common agreement were identified. A panel of qualified persons was asked to name fifteen school administrators in Kansas who would be in a position, because of extensive experience and success in building programs, to give the most help in a survey of this nature.

Tryout interviews were held with three school administrators, both to help identify areas for investigation and to perfect the questionnaire form. As a result of these interviews the study was limited to the following areas: (1.) Selection and contracting of architects, (2.) Advertising, bidding and selling of bonds, (3.) Selection and contracting of the general contractors of sub-contractors, (4.) Letting of bids for construction and equipment.

Prior agreement was secured from fifteen of the selected school administrators to complete the questionnaires, the forms were mailed and, after return, interpretations were made. A comparison of the commonly accepted view of writers and the practitioners was made.

Findings:

Legal provisions regarding issuance of school bonds, school building codes in the various states, and standard contracts of organizations such as the American Institute of Architects provide what appears to be reasonably acceptable guides to procedure. Never-the-less, outside the limits suggested above, there are variations which make it essential for school administrators and boards of education to employ expert assistance at many points. Attorneys, bond experts, engineers and other technical assistants may properly be called upon as a safeguard in making many decisions.

Conclusions:

The neophyte school administrator or inexperienced boards of education need much help in moving into a building program. Problems and issues that have not occurred to them are often realized after it is too late to make correction. A study of accepted practices, the experiences of successful administrators and technical advice from lawyers, bond experts and engineers all provide some safeguards.

There were no substantial disagreements between school administrators in Kansas, or between what writers of literature in the field and what practitioners say they do. On only one minor point; regarding the importance of architect's experience in school construction, did any major difference occur.

Legal safeguards and standard contracts do not provide sufficient safeguards in all aspects of bonding, contracting and selection of architects and contractors. School administrators can profit from the experiences, failures and successes of persons experienced in the problems.

Microfilm \$2.55; Xerox \$8.80. 195 pages.

A COMPARISON OF CERTIFICATION REGULATIONS FOR SUPERINTENDENTS, PRINCIPALS, COUNSELORS, AND SUPERVISORS ESTABLISHED BY EDUCATORS WITH REGULATIONS ESTABLISHED BY LAY PERSONS.

(L. C. Card No. Mic 60-898)

Richard M. Griffith, Ed.D.
University of Kansas, 1959

The purpose of this investigation was to compare the regulations for certification as a public school superintendent, public secondary school principal, public secondary school counselor, and public secondary supervisor that have been established by educators (public and private elementary and secondary school teachers, administrators, counselors, and supervisors; college and university professors and administrators; and State Department of Education officials) with those that have been established by lay persons (persons other than educators).

To obtain the necessary information, each state certification official was questioned regarding the persons who established the certification regulations in effect in the state in which he was employed. Also he was asked to send the writer a copy of current state regulations. By this method, information was found regarding certification policies in 48 of 52 states --- including the District of Columbia and Puerto Rico --- and therefore conclusions were based on regulations in these 48 states (92.3% of the total number) as of December 15, 1958. From information obtained from the questionnaire, each state was placed in one of four groups of states depending on the comparison of the percentage of educators with lay persons who established the certification regulations in the state.

An examination was then made of various state certification regulations in order to determine the following regarding each of the positions in each group of states included in the study:

- A. Certificates issued and the necessity of being certified
- B. Length of validity of certificates
- C. General requirements (conditions necessary for receiving any certificate)
- D. Education requirements (general and professional)
- E. Experience requirements
- F. Renewal requirements

Then, the number and percentage of states in each group of states in which a certification regulation was in effect --- for example, the requirement of three years of teaching experience for certification as a superintendent --- were found. Also, whenever it was possible and an aid in accomplishing the purpose of the study, the average regulation and the diversity of the regulations in states in each group of states were found. For instance, --- again referring to the previous example --- the median, mode, mean, and range years of this required teaching experience were determined. And, in order to maximize the usefulness of the study, whenever possible, this analysis was made for two levels of certificates --- the initial certificate (defined as the most easily obtained certificate because possession of it required a lesser amount of college

preparation or a shorter working experience than for other certificates issued for certification for the same position) and the final certificate (defined as the most difficult to obtain certificate because possession of it required a greater amount of college preparation or a longer working experience than for other certificates issued for certification for the same position). All regulations regarding certification for all of the positions included in the study were similarly treated.

The most generalized conclusion was that certification regulations established by educators were about the same as those established by lay persons. However, there was some indication that for certification as a superintendent, principal, counselor, and supervisor, educators favored more than one level of certificate, more college preparation, and less professional preparation.

Microfilm \$3.60; Xerox \$12.60. 279 pages.

A STUDY OF APPROACHES AND PROCEDURES FOR THE EMPLOYMENT OF PUBLIC SCHOOL TEACHERS

(L. C. Card No. Mic 60-1251)

George M. Henderson, Ed.D.
University of Oregon, 1960

Adviser: Keith Goldhammer

This study deals with the recruitment, selection, and placement of qualified teachers in the public schools. The purposes of the study are indicated as follows:

1. To identify and examine those principles and concepts of personnel administration fundamental to the employment of teachers.
2. To determine teacher employment approaches and procedures used by a selected sampling of Oregon public school districts.
3. To project a defensible pattern of teacher employment procedures for public school employment officials.

The study included an extensive perusal and analysis of the professional, theoretical literature in the fields of educational administration, industrial psychology, and personnel administration in business and industry. Research studies pertinent to the problem in these fields were studied for their methods, findings, and conclusions or recommendations.

Field practice data were obtained from a selected sampling of sixteen Oregon school districts through the use of teacher employment interview guides developed to secure pertinent data. Attention has been given to a comparison of field data with theoretical principles and concepts of personnel administration and to emerging practices and projected plans for the expansion and improvement of the teacher employment program.

Data from the study point to five significant areas of developmental need for the improvement of teacher employment programs:

1. The predominant concern of school administrators must be that of personnel administration, the first significant phase of which is effective teacher employment procedures. There is a need for school employment officials to study and develop that concept of school administration which attaches primary importance to personnel functions as an essential aspect of executive leadership. Fundamental to this concept of administration is a rationale of the executive as a person who is concerned with human relationships and who possesses certain technical skills and competencies necessary for the selective evaluation of personnel.
2. There is a need for further improvement in organizational structures designed for teacher employment functions. Existing broad patterns of school personnel organization are often not geared to the employment tasks. Policy development, patterns of relationships and responsibilities, the assignment of employment personnel, and the provision of time and money for the activity, are areas indicated for development or improvement.
3. There is a need for the establishment of well ordered procedures and techniques for the employment of public school teachers. Data revealed the need for sequential steps, systematic procedures, and the effective application of certain clinical type skills and techniques of assessment in the employment process. Reference is made to job analysis and description, personnel qualifications, contacting procedures, collecting information, evaluative appraisal, selection, and placement.
4. There is a need for improved teacher recruitment and closer working relationships between employers and teacher placement agencies. A more vigorous and active pre-service recruitment of young people into the profession, and recruitment and contacting procedures over wide areas of the nation are indicated. Closer and more effective working relationships need be established between the various types of teacher placement agencies and school employment officials.
5. There is a need for improved placement and initial orientation procedures as a part of the teacher employment program. These activities are indicated as very important to teacher adjustment and performance. Data reveal that many procedures in use do not provide the information most desired by teachers.

The study provides a projected pattern of teacher employment approaches and procedures based on interpretation and application of the data secured. This outline of the employment program is advanced as a guide to the better alignment of contemporary practices and the evidence developed from available literature and research dealing with personnel administration in the fields of education, business and industry.

Data from the study indicate that school employment officials do not consciously seek a teacher stereotype. They attempt to develop selective appraisals in the light

of certain desirable general characteristics and those specific qualifications deemed necessary for the particular position assignment. The study points to specific selective criteria in five general areas: (a) personal characteristics, (b) academic preparation, (c) teaching skills and talents, (d) experiential background, and (e) attitudinal characteristics and the ability to relate effectively to others. Evidence indicates that the personal characteristics, personality and attitude along with the cadet or job experience of the teacher are significant and major criteria used in the selection and employment process.

Microfilm \$3.30; Xerox \$11.50. 254 pages.

**PROPOSED CURRICULUM REVISIONS IN A
GENERAL EDUCATION CONTEXT FOR THE
ART DEPARTMENT OF OTTAWA UNIVERSITY**

(L. C. Card No. Mic 60-899)

Dana Francis Johnson, Ed.D.
University of Kansas, 1959

Until the time of the Revolutionary War the dominational college in the United States had as its purpose for existence the training of church leadership. From the time of the Revolution until the present there has been an emphasis laid increasingly upon education for the youth of the various denominations, aside from leadership training. Early colleges concerned themselves with the indoctrination of certain church beliefs, but since the middle of the eighteenth century the trend has been to train all youth for society and to emphasize intellectual accomplishment. Indeed, most colleges today know very little about their own church polity but are more concerned with bridging the gap between adolescence and maturity to equip youth for the complexities of modern life. A plan known as general education is in current acceptance among educators to achieve this end. The growth in popularity of general education dates from about forty years ago and stresses the development of youth in a way to bring out individual potentials that can contribute to the society into which they will eventually move.

Ottawa University is typical among the various colleges of the West and the Middle West, having been founded by the Home Mission Board of the Northern Baptists late in the nineteenth century. Its curricular development parallels closely the trends in American higher education. Even within the last three decades a program of general education has been instituted, although this program fails to reflect the same liberal philosophy found in the more pure forms of it because of a lack of student-centeredness. As is evident from an analysis of the general education syllabus published by the University, the curriculum is actually a modification of the departmental form of education which includes certain periodic examinations reminiscent of the colonial forms of higher education.

To bring the curriculum of the entire school into line, not only with the concepts of general education as a whole, but with other important features of modern educational concepts as well, several modifications are necessary. These modifications pertain for the most part to a change in emphasis on faculty dominated curricular structures to more student participation in these affairs. This means

the rewriting of the schools objectives of education and the entire general education syllabus. It further implies a re-orienting of faculty attitudes relative to the purposes of higher education.

The art program, as a specific interest in this study, cannot serve the needs of the general student because of the failure of the University as a whole to demonstrate an active faith in the student's capacity to select appropriate educational experiences. At present there is a need for additional opportunities for the general student to find art experiences which will make his understanding of the visual arts more thorough and accurate. There is need for more opportunities for the student interested in art as a vocation to develop his interest more fully. These major deficiencies and other minor ones, can be met by re-writing the objectives of the Department to make the program more student centered, by enlarging the staff to make possible the enlarging of the art program with a greater campus outreach, and by establishing a more complete course of major study in at least two different fields of concentration. Regarding these fields, two should be offered because of their common acceptance among students training for a vocational career in art, commercial art and art education. Basic courses in art together with general education in a re-structured form, would serve as foundation for these students, thus satisfying the University's concern for the individual development of each student.

Microfilm \$3.05; Xerox \$10.60. 234 pages.

**THE DEVELOPMENT OF DESIRABLE
ADMINISTRATIVE PRACTICES FOR
DEPARTMENTS OF MUSIC IN INSTITUTIONS
OF HIGHER EDUCATION**

(L. C. Card No. Mic 60-1116)

Samuel Turner Jones, Ed.D.
New York University, 1959

There is a need for a list of desirable practices related to the mechanics of administration which can be recommended for higher education music departments, the application of which will relieve administrators from dealing with matters which should no longer be problematical, but should be accepted as being part of the administrative process.

In order to develop such a list, the writer decided to try to evolve guiding principles for higher education departmental administration, and then develop administrative practices consistent with these guiding principles which could be applied to the mechanics of higher education music department administration.

Five specific problems were set up, with the hope that the solution of the fifth problem would take the form of a list of desirable administrative practices for higher education music departments.

These five specific problems took the form of five questions as follows:

1. Which aspects of departmental organization and procedure are administrative in nature?
2. What guiding principles for higher education departmental administration can be evolved?

3. What are the present administrative practices in music departments in higher education?

4. To what extent do present administrative practices in higher education music departments conform to the guiding principles evolved?

5. What administrative practices consistent with these guiding principles can be recommended for higher education departments of music?

The investigation is concerned with the following ten areas of administration: curriculum; finances; personnel; philosophy; plant, equipment, and supplies; public relations; records and reports; scheduling; school officers; and students.

Data on higher education departmental and institutional administration were collected through extensive reading. One hundred thirty-six functions which seemed to the writer to be of a departmental administrative nature were incorporated into a check-list and submitted to a jury of fourteen leaders in the field of educational administration. The jurors, by means of majority vote, validated one hundred ten functions as being applicable to higher education departmental administration.

These one hundred ten functions were translated into statements of guiding principles, and were submitted in the form of a check-list to a jury of twenty-six leaders in the field of educational administration. Forty guiding principles for higher education departmental administration were evolved by majority vote of the jurors.

Data on present higher education music department administrative practices were collected through the use of a questionnaire submitted to one hundred sixty colleges scattered throughout the United States. Present administrative practices in higher education music departments were compared with the guiding principles evolved and were found to have a percentage of conformity ranging from zero to 87.5%. The mean is 22.27%. The median lies between 16.07% and 15.8%. Of the one hundred two present practices reported upon, only fourteen conform to the guiding principles evolved in 50% or more of the institutions reporting.

A check-list which matched the guiding principles evolved with the present practices revealed was devised and submitted to a jury of thirty-four higher education music department chairmen. The tabulation of the majority vote of those jurors resulted in the listing of one hundred eight desirable administrative practices for higher education music departments.

It is recommended that this list of one hundred eight desirable administrative practices for higher education music departments be applied as widely as possible, and also be made the basis for future discussion and study by such bodies as are concerned with higher education music department administration.

Further study and research are needed in almost all areas of higher education music department administration. Fourteen suggested research problems are listed at the conclusion of the present study.

Microfilm \$3.95; Xeros \$13.95. 308 pages.

A STUDY OF EXPECTED AND DESCRIBED LEADER BEHAVIOR OF PRINCIPALS OF SENIOR HIGH SCHOOLS IN THE STATE OF MINNESOTA

(L. C. Card No. Mic 60-929)

Samuel Robert Keys, Ph.D.
University of Minnesota, 1959

The problem of this study was two-fold: to discover relationships and conflicts in leader behavior of principals of senior high schools as seen by teachers, superintendents, and principals themselves; and to determine the relationship between these conflicts of opinion of leader behavior by these three groups and an effectiveness-evaluation by the State Department of Education.

Two instruments were used to gather the information for this study. The Leader Behavior Description Questionnaire, developed by the Personnel Research Board of Ohio State University, was used to establish a measure of the discrepancy in scores describing the leader behavior of principals by teachers, principals, and superintendents. Relationships between the opinions of the three groups on the leader behavior of the principal were also studied. The questionnaire identified two dimensions of leader behavior: Consideration and Initiating Structure. Consideration is defined as behavior indicating warmth, friendliness, mutual trust, and respect; while Initiating Structure is defined as more directive behavior delineating the relationship between the principal and members of his staff, setting up channels of communication, establishing well-defined channels of organization, and establishing methods of procedure. The questionnaire was sent to principals, superintendents, and a sample of teachers of thirty-six of the state's forty-five three-year high schools. An eighty-one per cent return enabled thirty-two of the schools to be included in the study.

The second instrument was devised to obtain a "structured" estimate of the ranking of the schools in the study by the State Department of Education on their effectiveness. Their instructional program, special education provisions, and administration of the schools were considered in this evaluation. State Department officers were asked to rate by consensus each school in the study on nine questions, rating them on a five-point scale, on the basis of their experience with secondary schools.

Total scores on the two types of behavior and the two dimensions of each type made it possible to compare within-group and between-group scores as well as compute discrepancy scores representing conflicts of opinion between groups. Some of the important results and conclusions of the study were as follows.

Teachers and principals were found to be in close agreement on the described and expected leader behavior of the principal. Superintendents were consistently higher in their estimation of actual behavior and expectations for desirable leader behavior than the other two groups. This may be due to the proximity of teachers and principals in the daily performance of their job; whereas the superintendent is more removed from this contact.

The study revealed that the actual behavior of principals fell short of the expected or ideal leader behavior of principals. The gap between expected and described leader behavior of principals remained fairly consistent in all three groups, suggesting that this was a true difference.

In general, little correlation was found between the amount of conflict of opinion between teachers and principals and between superintendents and principals and the State Department's effectiveness-evaluation of the school. However in the dimension of Consideration, correlation was found between discrepancy scores of principals and superintendents' described leader behavior of the principal, and the comparison between discrepancy scores of principals and teachers' described leader behavior of the principal in the same dimension also approached correlation. This probably reflects the strong human relations approach being given in the training of educators.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

ANALYSIS OF THE LEGAL ASPECTS INVOLVED IN DISMISSAL OF PUBLIC SCHOOL CERTIFICATED PERSONNEL

(L. C. Card No. Mic 60-562)

Nathan Samuel McCray, Ed.D.
University of Southern California, 1960

Chairman: Professor LaFranchi

The purpose of this investigation was to study the legal aspects involved in dismissal of public school certificated personnel. While the study was nation-wide in scope, it gave special attention to California rulings.

The method utilized in the study was legal research. Judicial decisions (primary authority) and case finders, digests, legal encyclopedias, and annotated law reports (secondary authority) represented basic source materials. From case analysis the legal rulings (findings) were synthesized into controlling principles (conclusions) as a basis for recommendations.

Findings. (1) Courts considered dismissal actions to be an executive function of the board subject to review only for abuse of discretion and held that schools are better managed by boards of education than by juries or courts. Rigid legal rules in hearings are not necessarily applicable. (2) Sufficient and insufficient grounds for dismissal vary slightly throughout the several jurisdictions according to state statutes. (3) California boards of education acting in good faith within statutory limitations possess supreme power. (4) A California teacher is an employee rather than an officer of the state. (5) The mere fact that unprofessional conduct is not defined by statute does not render it void because of uncertainty. (6) The target for litigation with respect to teacher loyalty and subversion has been the constitutional and legal testing of statutory procedures designed to handle such cases. Membership in the Communist Party is prima facie evidence of one's disqualification to teach. Refusal to answer relevant questions constitutes a legal ground for dismissal following a hearing. (7) The special handling of California large-district personnel is not unconstitutional. There is no legal place for cross complaints in California dismissal actions, and teachers are not entitled to a trial by jury.

Conclusions and Implications. (1) An area of responsibility for the gathering, briefing, and dissemination of current legal decisions, opinions, and investigations should be included within the framework of district personnel

organizations. (2) Boards of education and public school administrators do not have to submit to irresponsible personal attacks by public school employees. (3) The executive session offers specific advantages in the dismissal process. (4) The courts have generally supported the board in litigation involving salary schedules. (5) Public school employees have a constitutional right to free speech but no constitutional right to teach. Teachers face inevitable dismissal after hearing on failure to testify. (6) What is needed is not more dismissal laws but better use of the present statutory framework. (7) Unprofessional conduct is a relative expression without technical meaning. (8) District rules and regulations in effect are part of the teaching contract. (9) Failure to continue professional training may result in salary decreases.

Recommendations. (1) Boards of education should avoid dismissal actions but not at all costs. (2) Control over personnel matters should be surrendered only as a last resort. (3) The California ninety-day period for handling correctable faults is crucial and should be used to salvage good teachers from dismissal action. (4) In cases where faults are noncorrectable the process for the handling and removal of such personnel should be promptly initiated. (5) A continuing evaluation of district personnel policies, rules, and regulations is recommended. (6) The criterion for evaluating potential dismissal actions is promotion of the best interest of the public school. (7) Rating procedures when used as a basis of salary raises should be nondiscriminatory and reasonably objective. (8) The basic virtues of common sense and good professional judgment are factors important to the reduction of dismissal litigation. Microfilm \$4.75; Xerox \$16.65. 369 pages.

ORGANIZATIONAL PATTERNS FOR SUPERVISORY SERVICES IN SELECTED CALIFORNIA UNIFIED SCHOOL DISTRICTS

(L. C. Card No. Mic 60-563)

Henry Samuel Molino, Ed.D.
University of Southern California, 1960

Chairman: Professor LaFranchi

The purpose of the study was to determine standards for the evaluation and improvement of supervisory organizations in unified school districts.

Fifty-seven California unified districts with enrollments in excess of 900 pupils, representing 94 per cent of the systems contacted, participated in the study. Of these, six were selected for intensive survey and analysis.

Exhaustive data were collected through structured interviews and questionnaires completed by teachers, administrators, and supervisors in these six districts.

Findings. (1) The types of administrative, supervisory, and special teaching positions varied greatly among districts. (2) Elementary school principals served for ten calendar months in two thirds of the districts; this was true of about half of the junior high school principals and one fifth of the senior high school principals; three fourths of the latter served for eleven or twelve calendar months; supervisory personnel and special teachers were generally

employed for ten calendar months. (3) Factors most often mentioned as influencing the organization of supervisory services were the philosophy of the district, the needs of pupils and teachers, the available personnel already in the district, and the financial limitations of the district. (4) Supervisory organizations were generally well understood by administrators and elementary teachers, but not so generally among junior and senior high school teachers. (5) The major strengths of supervisory organizations, in the minds of superintendents or their assistants, were the clear-cut definition of responsibilities, recognition of the principal as the educational leader in his school, clearly defined relationships among supervisory personnel, a good educational climate created by the organization, and a competent staff.

Some forty criteria for supervisory organizations were developed by utilizing principles discussed in the professional literature and responses from 743 professional staff members. A few of these criteria are listed below as examples. (1) The coordination of supervision throughout all grade levels is the responsibility of one person, either the superintendent or a person designated by him. (2) The teacher at all levels of instruction is directly responsible to the building principal for the results of instruction in all curriculum areas. (3) The procedure for obtaining supervisory assistance is well understood by teachers at all instructional levels. (4) Administrative and functional charts of organizations with accompanying manuals are up to date and available in the school district. (5) The supervisory organization provides for effective articulation between elementary and junior high school and between junior and senior high school levels.

Conclusions. (1) No consistent pattern of supervisory organization exists in the unified school districts of California. (2) At present, the 6-3-3 plan of organization predominates among unified school districts of California and is becoming more prevalent as districts continue to grow. (3) The lack of funds for supervisory services is seriously handicapping the educational program in California. (4) Clarification is needed regarding the person or persons actually responsible for the evaluation of teachers.

Recommendations. (1) In view of the public's strong demand for an accounting of educational results, all educators should scrutinize objectively the total organization for providing supervisory services in their districts. (2) Master teachers should be utilized as teacher-consultants to assist elementary, junior, and senior high school teachers. (3) The teachers' manual issued by the school system should explain clearly the procedure followed in evaluating teachers. (4) A number of survey teams should be established by the California Association of School Administrators which, upon invitation, would assist districts in evaluating their supervisory organizations according to established criteria and district needs.

Microfilm \$5.35; Xerox \$18.90. 419 pages.

IMPLICATIONS FOR THE TEACHER EDUCATION PROGRAMS OF TWO FLORIDA NEGRO COLLEGES FOUND IN PROBLEMS OF RECENT GRADUATES WHO TAUGHT, AND OF SENIOR STUDENTS.

(L. C. Card No. Mic 60-1203)

Bradley George Moore, Jr., Ph.D.
The Ohio State University, 1959

This study had as its major purposes the investigation of (1) the problems encountered by beginning teachers who were recent graduates of one or the other of the two institutions considered; (2) the relationships between these problems and the strengths, weaknesses, and lacks of the pre-service programs of these individuals; and (3) possible changes which might make these programs more useful to the graduates in their early years of teaching. The two institutions considered in this study were (1) Bethune-Cookman College, Daytona Beach, Florida, and (2) Florida Agricultural and Mechanical University, Tallahassee, Florida.

Three major instruments used in collecting data for this study were (1) a form for beginning teachers containing four open-ended questions and twenty-four items arranged on a five-point scale, (2) an interview form for principals and supervisors which was a modification of the above form, and (3) an appraisal sheet for seniors in teacher education curricula containing three open-ended questions and a check list for estimating the effectiveness of their pre-service program. One hundred and sixteen beginning teachers with one to four years of teaching experience who were actually engaged in teaching during the spring of 1958, twenty-five principals who supervised 70 per cent of these beginning teachers, and two hundred and thirty-nine seniors in the two institutions under consideration during the school term of 1958-1959 were included in this study.

The major findings were as follows:

1. The problems encountered by Negro beginning teachers were found to be typical of those reported in studies reviewed by the writer.

2. The six problems encountered by the recent graduates of institution A which the writer found to be most significant were (1) "dealing with disciplinary problems of students," (2) "motivating and stimulating pupils," (3) "inadequate academic background of the teachers," (4) "self-management and human relationships," (5) "using method of teaching," and (6) "inability to teach with available facilities."

3. The six problems encountered by the recent graduates of institution B which the writer found to be most significant were (1) "dealing with disciplinary problems of students," (2) "motivating pupils," (3) "classroom management and dealing with teaching routines," (4) "teaching with available facilities in the schools," (5) "using methods of teaching," and (6) "inability to teach with available facilities."

4. Although it was noted by the writer that personal weaknesses of the teachers and difficulties in the teaching situations were reflected in these problems, it was also found possible to derive a causal relation between each teaching problem and one or more program weaknesses.

5. In view of these findings it was possible to suggest specific ways in which the two teacher education programs

might be improved as well as to offer general recommendations to other institutions concerned with the preparation of teachers and to administrators of the schools in which prospective teachers gain needed professional experiences and in which the beginning teachers find employment. Microfilm \$4.15; Xerox \$14.65. 324 pages.

**A COMPARATIVE STUDY OF THE
ORGANIZATION AND FUNCTIONS OF THE
COMMISSIONS AND COMMITTEES OF THE
REGIONAL ACCREDITING ASSOCIATIONS**

(L. C. Card No. Mic 60-688)

Elbert Wakefield Ockerman, Ed.D.
University of Kentucky, 1950

Purpose of the Study

The purpose of this study is to compare the functions and organization of the Committees and Commissions of the six regional accrediting Associations.

Procedures of the Study

The study is organized into six divisions; namely, an historical sketch of the Associations and their Commissions; present organization of the Commissions and Committees of the Associations as provided in the Constitutions; stated functions of the Commissions; an analysis of the organization, functions and activities of the Committees and Commissions particularly with a view to determining the adequacy of the framework under which they are operating; and the summary and recommendations.

The emphases of the various divisions of the study are implied in the preceding paragraph. The historical sketch of the Commissions covers the period from the formation of the Association to the conclusion of World War II, with emphasis upon the conditions under which the Commissions and Committees were formed, time of their formation, and their responsibilities. Some of the outstanding problems and issues that they have faced are noted. In the chapters on organization, functions, and activities of the Commissions the period covered is largely since 1945. The basis for comparing the functions and organization of the Commissions is, for the most part, the Constitution of each of the Associations. Some additional material is examined when pertinent. The summary and recommendations of the study are concerned with a pulling together of all the material presented and the making of pertinent recommendations. The analysis chapter presents a closeup look at the relations of the organization, functions, and activities of the Commissions and Committees. Criteria have been determined by which the adequacy of the structure of and provision of the Commissions can be determined.

Materials and resources used have come largely from four sources; namely, proceedings of the various Associations, histories of four of the Associations, special publications of the Associations and the Committees, and material supplied by the secretaries of the Commissions and secretaries of the Associations.

Recommendations

Based upon the findings of this study and the material presented general recommendations are made. (In addition, specific recommendations, not listed here.)

It is recommended that:

1. The efforts to establish an effective National Committee on Accrediting Agencies should be encouraged by the Associations.
2. The Secondary Commissions give more attention to articulation between elementary and secondary schools and that the Higher Commissions give more attention to articulation between secondary schools and colleges.
3. The New England Association consider becoming a regional accrediting Association.
4. The Associations continue sending fraternal delegates and representatives to attend the annual meetings of the Associations.
5. Associations not having Third Commissions like the Commission on Research and Service and the Commission on Curricular problems and Research give consideration to the establishment of such Commissions.
6. The executive committees of the Associations be given less powers of direct supervision over the activities of the Commissions and that the executive bodies of the Commissions themselves be endowed with more power of final decisions.

It is recommended that:

1. The terms of office of membership on all types of Commissions be limited to two successive three or four-year terms.
2. The Constitution of the Associations be specific at the point of providing interim bodies for the Commissions or give the Commissions the power to designate such agencies.
3. There be definite provision made for both geographical and institutional representation on all of the Commissions.
4. The differences in statements of organization and functions of the Higher and Secondary Commissions be eliminated.

Microfilm \$5.00; Xerox \$17.80. 392 pages.

**THE GENERAL MUSIC COURSE IN THE
NEW YORK CITY HIGH SCHOOLS:
A FORMULATION OF OBJECTIVES FOR THE
REQUIRED GENERAL MUSIC COURSE, WITH
RECOMMENDATIONS FOR IMPROVED TEACHING
AND ADMINISTRATIVE PRACTICES.**

(L. C. Card No. Mic 59-6227)

Herbert Allen Orshan, Ed.D.
New York University, 1959

The Problem

This study was designed to formulate objectives, pupil experiences, organizational patterns, administrative procedures, teaching procedures and teaching aids for the

New York City required general music course. The investigation did not attempt to correlate high pupil achievement of the desired aims with any particular methods of organization, administration or teaching, but it may serve as a necessary first step to such a correlation. This study was designed also to indicate to what degree contemporary practices are presenting the pupil experiences deemed necessary for the high school general music course in New York City.

The study assumed a degree of importance because the general music course is required of all high school pupils for a minimum of four semester periods.

The study served as a guide for the work of the Standing Committee on curriculum revision, as it applied to required general music.

Procedures

A questionnaire containing proposed objectives was drawn up by the investigator and checked by an advisory committee consisting of licensed music chairmen, the Director of Music for New York City and the Assistant Director of Music. Copies were sent to all of the music chairmen in the fifty-five academic high schools of New York City. The chairmen were asked to rate the proposed objectives as to relative importance, using a scale designed for the purpose.

A second questionnaire containing proposed organizational plans was designed and submitted to the advisory committee. This form was also sent to the music chairmen who were asked to indicate their preferences. The form also solicited information about administrative procedures, pupil experiences, class sizes and teaching aids.

A third questionnaire was designed and submitted to the advisory panel. Five thousand copies of this form were sent to pupils who were completing the general music course. The questionnaire permitted the pupils to express their opinions about various aspects of the course, and to indicate what some of their outside musical activities were. The form also enabled them to report on the experiences they had in school and the teaching procedures and teaching aids used in their classes. A random sampling was taken of the returns.

Summary and Conclusions

Ten primary objectives and four secondary objectives were approved by the music chairmen for the required general music course in the academic high schools.

The results of this study show that present practices are failing to achieve many of the desired objectives. Eighty per cent of the participating chairmen believe that general music should be required in the senior high school but only sixty per cent of them consider their courses successful at the present time. Much of the criticism leveled at the general music course concerns itself with the manner in which the course is organized and programmed.

There was little evidence of articulation between the high school general music courses and the preceding elementary and junior high school music courses, or influence shown by the general music course on the outside musical activities of the pupils.

Recommendations

The investigator has made eighteen recommendations, based on the results of this study. He recommends ten primary objectives and four secondary objectives for the general music course.

The investigator recommends an organizational plan of daily meetings for one term or a cycle system which is described in the study.

Class sizes should be reduced to an average of forty or forty-five. Present class sizes are as high as eighty. The teacher of general music should not be required to carry a heavier pupil load than his colleagues do.

Other recommendations are in the areas of administrative procedures, teaching procedures, pupil experiences, and teaching aids.

Microfilm \$2.50; Xerox \$7.40. 159 pages.

SUPERVISION IN INDUSTRIAL EDUCATION: SCOPE OF PRESENT PRACTICE, TEACHER REACTION TO THE PRACTICE, AND THE APPARENT EFFECTIVENESS OF THE PRACTICE.

(L. C. Card No. Mic 60-1283)

Donald Francis Peters, Ed.D.
University of Maryland, 1959

Supervisor: Doctor R. Lee Hornbake

Through this study an effort has been made to determine the nature and scope of the practice of supervision in industrial education, as described by and reacted to by experienced teachers, and to evaluate the data submitted, using an instrument developed for this purpose. The specific areas of inquiry were: (1) Nature and extent of the interaction between industrial education teachers and supervisors, (2) Teacher estimates of the adequacy of supervision, (3) Teacher appraisal of approaches used by supervisors in performing their supervisory functions, (4) Teacher expectations of supervision, and (5) Evaluation of supervision as reported by teachers.

Two devices were developed. One is an instrument for gathering data from experienced teachers in industrial arts and vocational industrial education on the subject of supervision. The second is a set of evaluative criteria for examining the data obtained from teachers.

Responses were received from 282 industrial education teachers located in thirty states. One-hundred, 78 were regarded by their respective supervisors as highly successful teachers. One-hundred, four were regarded as least successful. The respondents were among the 583 identified by local supervisors as potential respondents. The local supervisors, in turn, had been identified by state supervisors. No respondent had less than two years of teaching experience; 52 percent had taught 10 years or longer.

Teachers reported an average of five supervisory visits per year. There was no apparent pattern of relationship between educational factors (e.g. teacher experience, success rating of teacher, maturity level of learner, type of program) and the extent of supervision as measured in number of visits. Generally speaking teacher estimates of their supervision were favorable. Seventy-three percent expressed satisfaction in having supervisors present. Eighty-one percent felt teaching had improved through working with their supervisors. Eighty-six percent felt free to take to their supervisors problems other than teaching problems.

Respondents reported 229 examples of excellent and average experiences where there had been interaction between teacher and supervisor. Ninety-nine instances of poor or unsatisfactory experiences were described. Forty-five percent of all requests for assistance were met by individual conferences; nineteen percent were met by small group conferences.

When the responses were placed in the context of the evaluation device, several conclusions, on the level of generalizations, appeared in order.

1. Industrial education teachers who participated in this study apparently do not associate with supervision the clarification of aims, purposes and principles of education. There is little evidence of a growing mutual awareness of the educational benefits which are inherent in deliberations on this level. It is not apparent from the examples how a philosophy of industrial education operates in a fundamental way in advancing the teaching of industrial education.
2. Teachers request assistance in teaching methods and techniques apparently because techniques resolve immediate problems. At the same time these requests would appear to be opportunities for the supervisor to do more than satisfy immediate needs.
3. Teachers evaluate the effectiveness of the supervisor in terms of the regard supervisors show for the individual student or teacher.
4. Teachers on their own volition make a high percentage of their requests within the area of curriculum. This circumstance does provide the supervisor with opportunities to make a major contribution in the area of improved instruction.
5. Teachers do not report the use of a variety of organized in-service activities used by supervisors. The resultant pattern might reflect the narrow range of instructional problems considered by teachers and supervisors.
6. The dominance of favorable reactions toward supervisors and the initiative exercised by teachers in making contacts with their supervisors are complementary of teacher-supervisor relationships. The questionable element is the extent to which they dealt candidly with significant education problems.

Microfilm \$2.70; Xerox \$9.45. 208 pages.

ADMINISTRATIVE PROBLEMS, POLICIES AND PRACTICES IN PUBLIC SCHOOL STAGE AND AUDITORIUM CONSTRUCTION, MAINTENANCE AND USE.

(L. C. Card No. Mic 59-6818)

Sterling Eugene Stewart, Ed.D.

The University of Nebraska Teachers College, 1959

Advisers: Dr. F. E. Henzlik

Dr. Leroy T. Laase

Statement of the Problem

The purpose of the study was to (a) determine some major administrative problems, policies and practices in public school stage and auditorium construction, maintenance and use (b) discover the extents to which certain problems exist in large, medium-size and small schools (c) discover the nature of and the extents to which administrative policies and practices affected certain problems (d) determine the elements of construction, the policies and the practices which were considered adequate or satisfactory and (e) make summaries, draw conclusions, and make recommendations on the above mentioned administrative problems, policies and practices.

Procedure

The procedure used in this study consisted of the following four major steps:

1. The literature pertaining to the problem was surveyed in order to establish a yardstick for determining the adequacy of materials and conditions which existed, and which should exist if administrative problems are to be held to a minimum.
2. Opinions were obtained from school building specialists, architects and contractors in order to determine the various aspects of construction which were considered adequate.
3. Questionnaires were sent to administrators in large, medium-size and small schools in order to discover details regarding conditions which existed and conditions which were desired in connection with the problem.
4. Follow-up interviews were taken with drama, music and coaching faculty people and with custodians in a selected group of schools in order to (a) obtain detailed information (b) validate a number of the questionnaires and (c) determine the extent of agreement between faculty and administrators on certain aspects of the problem.

Major Conclusions

Responses to approximately two-hundred items from one-hundred forty-four schools were tabulated, classified and analyzed and conclusions and recommendations were drawn on the basis of these data.

1. The majority of the problems pertaining to public school stages and auditoriums were found to be problems in construction, maintenance and use. Administrative policies and practices were definite influences on the severity of the problems and were influences which could most readily provide remedies to the problems.

2. Large schools have, in general, decidedly better equipment, better practices, better policies and cope better with problems than do the medium-size or small

schools and the small schools do not, in general, come up to the standards of adequacy which one might expect to find in the medium-size schools.

3. Inadequate stage and auditorium equipment and construction can be attributed to financial limitations as well as to unwise administrative practices and policies.

4. Administrative "headaches" which ranked highest in stage and auditorium use, were scheduling, acoustics, storage space, use by outsiders and rehearsals.

5. It was generally agreed, by all sources that combined auditoriums and gymnasiums are not usually satisfactory for dramatics nor for athletics.

Some Basic Recommendations

1. The size of the school, the school policies and program, anticipated extent of community use and availability of other community facilities should be carefully considered before the size of a proposed auditorium is definitely established.

2. Stages should be large enough to handle anticipated as well as present needs. Recommended dimensions are: a depth of 30 feet and a length of 60 to 70 feet. The total wing area should be equal to one-half of the total stage area.

3. Administrators and faculty people should be less easily pleased with minimal equipment and should be familiar with diagnostic and remedial measures which may improve conditions.

Microfilm \$10.55; Xerox \$37.60. 834 pages.

UTILIZATION OF CLASSROOM FACILITIES BY ROOM SIZE IN FIFTH GRADES OF RAMSEY COUNTY

(L. C. Card No. Mic 60-975)

Marsden Burleigh Stokes, Ph.D.
University of Minnesota, 1959

Adviser: Otto E. Domion

PURPOSE

The purpose was to investigate, according to four room-size categories, allocation of floor space and utilization of spaces and classroom facilities.

PROCEDURE

The 112 public straight fifty-grade classrooms of Ramsey County, Minnesota, were classified according to room size with the square-foot categories being: under 750, 750 to 849, 850 to 949, and 950 or more. A stratified sample consisting of 45 rooms was drawn. In each of these the floor space allocation was determined for pupil-seating areas, furniture and equipment, and free floor spaces. In addition, during 12 one-half day visits in sample classrooms in each room-size category data were procured on the extent of pupil and teacher utilization of room facilities. Category totals and grand totals in "pupil-minutes" and "teacher-minutes" of utilization were calculated and percentages computed. Comparable data from the several categories were tested for statistical significance.

FINDINGS AND CONCLUSIONS

Technique--

The pupil-minute unit, devised as a measure of room utilization, appears to have value for further utilization studies.

Floor Space Allocation--

Pupil-seating Areas -- The mean floor space per desk in pupil-seating areas was 10.93 square feet. The average per desk increased from each room-size category to each next larger one but the only significant difference was between the 9.72 square foot average for the smallest room-size category and the 12.82 square foot average for the largest. Statistical tests did not support a determination that space per desk in pupil-seating areas would necessarily increase as average room size increased but a direct relationship was demonstrated.

Space for Other Furniture and Equipment -- The mean allocation of floor space for other furniture and equipment was 98.9 square feet with the standard deviation being 33 square feet. Average allocation per category did not increase consistently with increase in average room size.

Free Floor Space -- The mean free floor space per classroom was 389.2 square feet. Although the statistical techniques employed did not show all differences between averages for categories to be significant, the average amount of free floor space available increased from smaller to larger room-size categories.

Utilization of Facilities by Pupils and Teachers --

On the average individual pupils and teachers were in the classrooms just under 87 per cent of their time during school hours. Over 93 per cent of the pupil utilization of classroom facilities occurred in the pupil-seating areas. It was concluded that pupils in this population made use of other spaces and furniture and equipment much less than the literature seemed to indicate to be generally true. Factors other than room size seemed to be of equal or more importance than room size in their effect upon the extent of pupil utilization of pupil-seating areas, teachers' desks, free floor spaces, and other furniture and equipment.

Teacher utilization of classroom facilities was more diversified with about 32 per cent of the teachers' time being spent in the front free floor spaces, 21 per cent at teachers' desks, 21 per cent in pupil-seating areas, just under 8 per cent at the chalkboards and about 18 per cent utilization of other items or spaces. Significance tests led to the conclusion that room size seemed to have little to do with the extent of teacher usage of classroom facilities.

The study did not particularly support suppositions in part responsible for the trend toward larger classrooms.

Microfilm \$5.10; Xerox \$18.00. 399 pages.

HISTORY OF THE ORGANIZATION AND DEVELOPMENT OF PUBLIC EDUCATION IN SHASTA COUNTY, CALIFORNIA.

(L. C. Card No. Mic 59-1866)

Ernest Cleveland Stump, Jr., Ed.D.
University of Southern California, 1959

Chairman: Professor D. Lloyd Nelson

The purpose of this study was to record the history of the organization, growth, and development of public education in Shasta County, California, during a little more than a century of its existence. It was designed to show the relationship between the development of Shasta County and that of the provisions for public education therein and to determine the trends which may contribute toward an understanding of how to meet the educational problems of the future.

Examination was made of all available legal records and official documents pertaining to public education in Shasta County. Supplementary information was obtained from related literature and through correspondence, personal interview, or observation.

Findings. (1) The strategic geographic and economic position of Shasta County has contributed toward an unusually interesting and favorable form of development. (2) Sporadic population growth has provided problems in the organization and development of public education in Shasta County. (3) First schools in the county were privately operated through means of subscriptions and fees, but attempts were made by public authorities to provide educational opportunity free of charge to those who could not pay. (4) Earliest school ventures of 1853-54 were short-lived, but the cause of public education was advanced through the construction of the first public schoolhouse by the citizens of the community of Shasta in 1854. (5) After 1854 some type of public school was operated each year in the town of Shasta and elsewhere in the county. (6) Some early school "districts" in the county originated in townships and precincts through spontaneous and extralegal means, but after 1857 the County Board of Supervisors officially ordered establishment of school districts as the need arose and means were available. (7) State legislation eventually dealt with early legal and financial problems and made some provision for education in the various counties of California, under many adverse conditions. (8) Transition from rate bill common schools to free schools was completed in the county by the end of the fiscal year 1866-67. (9) The minor office of County Superintendent of Schools was filled by the County Assessor until the office became elective in 1855, after which it gradually developed into a vital, intermediate service organizational unit in local school administration and now occupies an influential and important position in county administration. (10) Existing conditions necessitated the establishment of approximately 170 local school districts, many of which have been reorganized through annexation, unionization, and unification. (11) Despite traditions and reluctance to change, the tendency has been to reorganize for more efficient types of school districts, with the prevailing pattern being separate elementary and secondary districts, only one area having been joined together into a unified school district.

Conclusions. (1) The trend of public education in Shasta County has progressed from a period of no schools

to that of a few districts, then to a great number of districts; but the number is now decreasing and will continue to decrease with further reorganization. (2) There are too many districts in the County of Shasta, and further reorganization and unification are needed. (3) The movement of population into Shasta County will continue at an increasing rate. (4) The citizens of Shasta County have demonstrated their willingness to support free public education and will continue to be willing to follow their established pattern of providing for public education under changing conditions. (5) The structure and pattern of school district organization and administration in Shasta County should be improved.

Recommendations. (1) Educational leaders in Shasta County should acquaint themselves with the history of the organization and development of public education in the county in preparation for meeting the demands of the future. (2) Citizens of Shasta County should demonstrate their willingness to work toward better school district organization in the county. (3) A study should be made to determine advisability of the early establishment of a separate junior college district encompassing a greater part, if not all, of Shasta County. (4) Further studies should be made to determine the evolution of school district boundary lines, tax increases, and bond issues in Shasta County. (5) The history of the organization and development of public education in Shasta County should be made a continuing matter of record in Shasta County.

Microfilm \$4.20; Xerox \$14.00. 325 pages.

CITIZENS' ADVISORY COMMITTEES IN THE COLORADO PUBLIC SCHOOLS

(L. C. Card No. Mic 60-1054)

David Ivor Williams, Ed.D.
University of Colorado, 1959

Supervisor: Professor Calvin Grieder

The purpose of this study was to locate within Colorado the school districts which had utilized citizens' committees during a three-year period; to establish criteria for evaluating citizens' committees; to analyze the work of existing committees by a questionnaire; to further investigate and analyze committees in selected school systems; to evaluate in detail committees in selected school systems; and to make recommendations for use in setting up new organizations.

The location of citizens' committees was successfully accomplished by a preliminary survey form distributed to all school systems with an administrator in charge. Criteria were established by review of literature which was synthesized with opinions of qualified persons to form an evaluative checklist. Data were gathered on the committees found by a questionnaire distributed to school systems which had used citizens' committees during a three-year period. A follow-up study by personal interviews was conducted in sixteen selected school systems. These citizens' committees were evaluated by the checklist criteria developed for this purpose.

The study is based upon forty-seven school systems (94 per cent) out of a total of fifty which qualified. Agricultural communities were the most common; the districts

varied in size and population from very small to very large; more committees were organized for school building programs than for any other purpose; the superintendent suggested the formation of the citizens' committees in approximately 60 per cent of the cases.

Affiliation with various groups, geographic location, and occupation were the factors which were used most frequently in selecting committee members; parents were represented on all committees; agriculture, business, and professional groups ranked next; size ranged from three to 200 members with most frequent size between twelve and twenty members with the median being fifteen; most committees (92.4 per cent) met in the evening with meetings ranging from one to six hours with median length being two hours; frequency of meetings was left to the discretion of the chairman in two-fifths of the committees but monthly meetings were the most common.

All committees were advisory; most frequent method of contact with the board of education was by board members attending committee meetings and joint meetings with the board; the newspaper was used most in informing the community; 86.2 per cent of the communities reacted favorably to the committees; three-fifths of the boards of education put recommendations into effect in part, with one-third of the recommendations implemented completely.

Of the committees studied, 87.7 per cent achieved the purpose for which they were organized. Approximately three-fifths of the committees avoided an educational crisis; 91 per cent of the committees were successful and 9 per cent failed, with success based upon adequate orientation of members, a well stated set of purposes, good leadership, good communication with the board, and adequate help from the professional staff.

Administrators, board members, and business people were willing and cooperative in telling the story of their citizens' committees in the sixteen selected school systems. The board of education appointed or selected the committee members in most cases; subcommittee organization was the most common after the parent committee had been selected; there were numerous accomplishments with relatively little difficulty experienced within the committees; 30.3 per cent of the characteristics of a good citizens' committee were met completely by the selected school systems; the characteristics were met in part by 68.2 per cent of the selected school systems; the more successful committees measured up to the characteristics more completely than did the less successful committees in the selected school systems.

Generally speaking, citizen participation in the public schools of Colorado for 1954 through 1957 was successful.

Microfilm \$4.20; Xerox \$14.85. 326 pages.

EDUCATION, ADULT

AN ANALYSIS OF EDUCATIONAL NEEDS OF ARKANSAS EXTENSION AGENTS

(L. C. Card No. Mic 60-1015)

Randel Keith Price, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Gale L. VandeBerg

The major purpose of this study was to identify educational interests of Arkansas agricultural extension agents in selected competency areas. Concomitant purposes were to reveal agents' opinions regarding the importance of certain kinds of knowledges and skills to agent effectiveness and to ascertain areas which agents felt they would like to include in their graduate study programs.

The selected competency areas were: Understanding social systems, program planning and development, understanding human development, extension organization and administration, the educational process, communications, effective thinking, research and evaluation, and technical knowledge.

Seventy-five county agricultural agents, 83 county home demonstration agents and 75 assistant and associate county agricultural agents responded to the 113 content items in the questionnaire. Data were analyzed for various tenure groupings, classifications by job responsibilities and agent evaluation records. Data were presented as percentage distributions, rank orders, rank order correlation coefficients and descriptive narrative.

More than 80 percent of the 233 agents indicated that possession of competency in the following ten items is very important to an extension agents' effectiveness: (1) An understanding of the duties and responsibilities of the extension worker at the county level, (2) How to analyze the situation in my county, (3) How to develop one's own leadership abilities, (4) A knowledge of how to identify leadership in the county, (5) How to organize effective program planning committees, (6) How to involve "lay" people in program development, (7) How to develop a long-time extension program, (8) How to identify problems in the county situation and determine priorities of problems, (9) How to conduct effective farm and home visits, and (10) How to use teaching methods more effectively.

More than 50 percent of all Arkansas agents identified the following nine content items to be those in which much training is needed: (1) How to develop one's own leadership, (2) How to prepare and deliver effective public speeches, (3) How to develop a long-time extension program, (4) How to organize effective program planning committees, (5) How to write effective news articles, (6) A knowledge of the principles and techniques of effective counseling, (7) How to use teaching methods more effectively, (8) How to involve "lay" people in program development, (9) How to analyze the situation in my county.

In subject matter training, specific agent groups said their greatest training needs were for family life, home furnishings, plant pathology, farm management, marketing and entomology.

Seven content items were indicated by more than 30 percent of all agents as areas they would like to pursue thru graduate study. They were: (1) A knowledge of how to identify leadership in the county, (2) How to develop

one's own leadership abilities, (3) How to use teaching methods more effectively, (4) An understanding of the duties and responsibilities of extension workers at the county level, (5) A knowledge of techniques for developing effective thinking in extension groups, (6) A knowledge of procedures for evaluating programs, (7) An understanding of how people are motivated.

More than 30 percent of two agent groups listed areas of technical subject matter for graduate study. Home furnishings was listed by 39 percent of the home agents and agronomy was listed by 31 percent of the assistant and associate county agents as desired subject matter areas for graduate study.

Microfilm \$2.60; Xerox \$9.00. 199 pages.

EDUCATION, HISTORY

THE STATUS OF CONSERVATION EDUCATION IN SELECTED INSTITUTIONS OF HIGHER LEARNING IN THE SOUTHEASTERN UNITED STATES—1954

(L. C. Card No. Mic 60-639)

Sam Edward Clagg, Ed.D.
University of Kentucky, 1955

Supervisor: Dr. J. R. Schwendeman

STATEMENT OF THE PROBLEM

The objective of this study was the analysis of the basic conservation course offerings and various conservation units in other courses in selected institutions of higher learning in the Southeastern United States.

The following sub-problems are listed:

1. determine the subject content of conservation courses and the extent of conservation offerings in other courses;
2. ascertain the methods used in conservation education as to course outline, texts, methods, and particular content emphasis;
3. obtain from instructors their opinions as to courses of value in preparing conservation teachers for public schools and their opinions as to what subject courses best lend themselves to integration of conservation materials and at what level;
4. determine the cooperation between the institutions and outside conservation agencies;
5. analyze the effectiveness of the institutions in meeting the conservation needs of their area.

DELIMITATIONS

This study was limited to that region making up the following states: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia. On the basis of certain criteria, fifteen institutions were selected to be interviewed and studied. Twenty-one additional institutions participated in the study by submitting information by questionnaire.

PROCEDURES EMPLOYED IN THE COLLECTION AND TREATMENT OF THE DATA

A personal interview with the conservation instructors in the fifteen selected institutions furnished the primary source of data. Data was collected from the additional institutions by using the interview check-list as a questionnaire. Questionnaires were also used in the institutions visited to obtain data relative to conservation offerings in courses not primarily concerned with conservation.

The interview findings are the first of the data to be tabulated. This is followed by a chapter of findings from the institutions studied by questionnaire. The succeeding chapter treats the data submitted by questionnaire from instructors teaching conservation as an integrated subject in courses not basically concerned with conservation. The final chapter contains conclusions and recommendations.

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the following implications may be gathered from this study:

1. All institutions of higher learning should make available to all their students a course in conservation not limited by prerequisites.
2. Departments of geography and education, working cooperatively, seem best suited for teaching conservation.
3. The ever expanding scope of conservation requires either a selected coverage of the more pertinent topics or more total course time.
4. The teaching of conservation is limited by lack of time and poor student background in conservation.
5. In view of the importance of the subject, not enough students were taking courses in conservation.

The following recommendations are made as a result of this study.

1. All educational and governmental agencies concerned with wise use of resources in this region should, through coordinated endeavor, make every conceivable effort to distribute the more important findings of this study.
2. All students in higher education should be required to receive a course of three semester hours credit in conservation instruction, and such instruction should amount to six semester hours credit for students in teacher education.
3. An instructor trained in both education and geography should conduct such courses.
4. Less of the lecture method and more field work, camping, laboratory sessions, demonstrations, and visual training aids should be used in teaching conservation.
5. Students should receive instruction in the principles of conserving soils, water, forests, minerals, and wildlife. If time permits, the scope of conservation topics could be expanded.

6. More effort should be made to carry the conservation programs of the institutions into the communities.

The following areas are suggested for further study:

1. A similar study should be conducted in other regions of the United States.
2. A study as to the extent and kind of conservation being taught in other courses not basically conservation courses should be conducted by the personal interview method.

Microfilm \$4.95; Xerox \$17.55. 387 pages.

THE AUDIO-VISUAL DEPARTMENTS OF FOREIGN INFORMATION SERVICES IN NEW YORK CITY

(L. C. Card No. Mic 60-1102)

Ruth R. Cornfield, Ph.D.
New York University, 1959

Purpose: To identify and trace the development of the audio-visual departments of foreign information agencies in New York City in order to ascertain the types of materials and services provided by their departments.

Procedure: Since there is no literature to which to refer on the subject of the establishment of the audio-visual services of foreign information agencies in New York City most of the data was of necessity obtained by a study of old and new film lists, catalogues, pamphlets and booklets and all other printed matter issued by the agencies as well as by personal visits, interviews with heads of departments and staff. The information thus obtained, not only gave the investigator the necessary data for tracing the history and development of such agency audio-visual departments but also revealed the underlying plans for the conduct of each agency and the philosophy relevant to their maintenance.

Results: Most foreign information agencies were established in New York City during World War II by foreign countries who felt the need for making their people and their role in this war known to the Americans. After the war these services were continued but the emphasis as to their purpose was changed. Some agencies emphasized the cultural heritage of their country, others, the economic and political aspects and still others, the tourist attractions. To date, six foreign countries have developed complete departments for the distribution of audio-visual materials; twenty distribute audio-visual materials and many other different kinds of materials such as posters, booklets, maps and photos and do not have separate audio-visual departments. Schools are the largest users of these materials but to date they have been used primarily for entertainment and club periods. The films available for circulation are not made to fit the needs of the American educational pattern. Except for the films of Turkey and Israel, foreign agency films were not even made specifically for use in the United States.

In those departments where the heads have been in charge for a considerable length of time, the lack of coordination between needs and materials has been recognized and steps have been taken to remedy the situation either by adapting existing materials or by producing filmstrips for American consumption. Reaction-to-materials records are required by very few departments and not sufficient publicity is given to make the educator aware of what materials and services are available. Materials for television are of concern in almost every department.

Recommendations: (1) Production of one film by each agency, for use in the American schools should be made; (2) Establishment of reaction-to-materials records and the organization of information gathered from these records so as to provide guide lines for more suitable materials and services; (3) Materials should be publicized and more audio material in the foreign language provided; (4) Slide collections should be enlarged, since these can be easily obtained and easily circulated and used; (5) Teachers of the United States should be encouraged to use these materials and to give suggestions as to what the agencies should provide for educational purposes.

Microfilm \$3.65; Xerox \$12.85. 282 pages.

EDUCATION, PHYSICAL

AN ANALYSIS OF THE TEACHING SITUATION OF GRADUATES HOLDING MAJORS IN PHYSICAL EDUCATION. (BASED UPON 42 INTENSIVE CASE ANALYSES).

(L. C. Card No. Mic 60-641)

Maurice Alton Clay, Ed.D.
University of Kentucky, 1955

Supervisor: Dr. Ellis F. Hartford

This thesis is concerned with an analysis of the teaching situation of graduates who have majored in physical education. It is based on very detailed interviews with 42 men. The problem was that of establishing facts from which teachers' training institutions should be able to adjust their academic policy to the needs of the teaching situation.

With this in mind, a specific system of questions was formulated in such a manner as to incorporate experiences of the graduates studied, to anticipate the possibility of certain defects, and at the same time to avoid introducing any limiting or prejudicial attitudes.

To facilitate a permanent system of check and counter check between the college and the teacher, the idea was conceived to introduce the I.B.M. punched card system.

It was clear from the outset that physical education as a thoroughly practical subject enjoys a different status in schools than the scholastic sector of study.

By confining the survey to men who hold majors in physical education and who had taught, a homogeneous sample was obtained which rendered it possible to use a numerically small group for an analysis in depth.

The literature pertaining to the theme of the thesis was surveyed, the interview form discussed, and the procedure of collecting and analyzing the material was described. Three broad findings emerged from the investigation. The first component is represented by the social and economic environment of the teacher. Economic restrictions, as far as they may affect the individual, may be a manageable problem if society possesses resources that are, or can be made, accessible to him. The analysis of the teaching situation, as given in this thesis, reveals many facets of the generally known economic deficiency pattern which is bound to differ from state to state and from society to society.

The second component which determines the total picture as disclosed by our study is that of the profound influence which is exercised upon the teacher's life by the quality and the spirit in which he is educated in college. In this context, two facts stand out, namely that the student, to become a good teacher, must be imbued with ideals, and that scientific and technical information must be presented to him within the framework of a total pattern. It is during the formative years in his college that the seed of a pattern of conceptual thinking must be established.

The third component is that of the individual personality of the teacher. It is the most difficult of the three and the one which is least amenable to many changes. In fact we have become convinced that to prepare the future teachers to face reality, and to meet social difficulties and the limitations of his physical teaching environment are among the greatest tasks that face teacher education. Few single extraneous situations that are known to cause complications in teaching have been encountered which were not overcome by individual educators who possessed the gift of facing and handling difficult situations. And conversely we have seen men fall in an environment that to the majority of teachers would have looked more than promising. It is not possible to measure the extent to which financial resources and education curricula can contribute to efficiency and happiness in teaching, but compared with inherent personality traits they would appear of limited significance.

Recommendations were made concerning (1) the teachers' training curriculum in physical education, (2) the functions of the State Department of Education, (3) and for changes at the local level in the administration of physical education and of school programs in athletics. Included were suggestions for needed studies.

Microfilm \$3.80; Xerox \$13.30. 294 pages.

**AN ANALYSIS OF SPORTSMANSHIP
RESPONSES OF GROUPS OF BOYS
CLASSIFIED AS PARTICIPANTS AND
NON-PARTICIPANTS IN ORGANIZED BASEBALL**

(L. C. Card No. Mic 60-1118)

Geneva Belle Kehr, Ed.D.
New York University, 1959

Purpose

The purpose of this study was to compare sportsman-ship responses among groups of eleven- and twelve-year-old boys who were classified as participants and non-participants in Little League Baseball.

Experimental and Control Groups

Six experimental and control groups were established for this study. The major classifications consisted of three groups of forty boys: Group I, participants in Little League Baseball; Group II, boys interested in Little League Baseball but who failed in tryouts; Group III, boys not interested in participation in any sport. Each group was subdivided into two parts, twenty eleven-year-olds and twenty twelve-year-olds. Individuals were selected on a random basis.

In a review of literature to determine factors which influence sportsmanship, two were found to have a relationship, intelligence and home influence. The groups were evaluated for these two factors by utilizing the Chi Square Test and an analysis of variance.

The investigator elected to study motor ability as a possible influencing factor. To establish a correlation between motor ability and sportsmanship, test scores for forty-eight boys, classified as non-participants, were utilized. The resulting correlation coefficient was not statistically significant.

A study of the representativeness of coaches was conducted to establish that those involved in this study were representative of all Little League coaches. A survey of a random sample of Little League coaches in the United States determined their ages, education, and occupations. In a comparison between the coaches of the boys involved in this study and the sampling of all coaches, no statistically significant difference in age, education, and occupation was found.

Sportsmanship Responses

The sportsmanship responses were determined by administering the McAfee Preference Record to eligible boys in four cities in Connecticut; once in the spring before league play began, and again in September following the season.

Comparison of Sportsmanship Ratings Among the Experimental and Control Groups

To test the various hypotheses of the study, comparisons were made by: (1) calculating the mean, standard deviation, and the standard error of the difference between means and applying the "t" test to determine the statistical significance, and (2) analyzing the variance and applying the "F" test. The five per cent level of confidence was accepted as indicating statistically significant differences.

Summary of the Findings

1. There were no statistically significant differences in the scores achieved by the following groups:

- a. the participants and non-participants,
- b. the participants and the interest group, and
- c. the interest group and the non-participants.

2. Although there were insufficient data to draw a statistical inference, evidence indicated that sportsman-ship scores were unaffected by several seasons of experience.

3. No statistically significant change occurred in the sportsmanship ratings of the boys participating in Little League Baseball for the first time, the interest group, or the non-participants group based on scores achieved before and after a season of play.

Conclusion

On the basis of this experiment, it may be concluded that Little League Baseball, as currently conducted, has no measurable effect upon sportsmanship as tested by the McAfee Preference Record.

Microfilm \$2.50; Xerox \$6.20. 130 pages.

DIFFERENTIAL APPLICATIONS OF RESISTANCE AND RESULTING STRENGTH MEASURED AT VARYING DEGREES OF KNEE EXTENSION

(L. C. Card No. Mic 60-561)

Gene Adams Logan, Ph.D.
University of Southern California, 1960

Chairman: Professor Lockhart

During the past decade several experimental studies have been made which were concerned with various applications of the overload principle in progressive resistance exercise through which strength is developed. Until recently strength increase was believed to be simply the result of physiological phenomena characterized by changes which take place in the contractile tissue. Recent studies, however, tend to indicate that learning and skill should also be considered as possible explanations of some apparent strength development. These studies have suggested the specificity of strength development within the range of motion.

This present investigation was initiated in order to determine if strength might be developed more efficiently by using muscles against resistance at specific angles within the range of motion than by other methods.

The problem of this study was to examine, at five selected angles, knee extensor strength development as a result of two types of progressive resistance exercises involving differentials of maximum resistance in two distinct portions in the range of motion.

Forty-five college students served as subjects and were randomly assigned to three groups of fifteen. The initial test means between the groups were compared to determine if the groups were representative of the same population. Comparisons of the group means at the five angles tested revealed that there were no significant differences between the groups in fourteen of the fifteen tests made. For each of the subjects, the strength of knee extension at various angles was measured, utilizing a modified quadrant assembly and a cable tensiometer. The angles of knee extension at which measurements were taken were 95 degrees, 115 degrees, 135 degrees, 155 degrees, and 175 degrees.

Group I began a knee extensor strengthening program using weight resistance, Group II began a knee extensor strengthening program using a spring resistance, and

Group III served as a control. Groups I and II employed the principles of the DeLorme method of progressive resistance exercise in thirteen exercise periods throughout six weeks. Each period involved twenty repetitions in two bouts of ten each.

In addition to the initial measurements, the subjects were tested at all angles between the sixth and seventh exercise sessions and at the conclusion of the six-week period. Group I developed strength with an exercise involving the greatest amount of resistance at approximately 155 degrees of knee extension and upward. Group II developed strength while meeting the greatest resistance at approximately 115 degrees of knee extension.

Differences between mean gains within the groups and between the groups were computed and tests of significance between their means were made.

Findings. (1) As compared with the control group, both experimental groups showed gains in strength significant at the 1 per cent level of confidence at all angles measured. (2) At 115 degrees, Group II showed significant differences in strength gains over Group I. (3) At 155 degrees, Group I showed significant differences in strength gains over Group II. (4) At 135 degrees, both Group I and II made gains significant at the 1 per cent level of confidence over the control group, but no significant differences in gains were found when compared with one another. (5) Group II appeared to develop strength predominantly during the first half of the strength training period, while Group I made the greatest gains during the second half of the strength training period.

Conclusions. (1) Muscular strength is developed at the point where the greatest resistance is applied. (2) A more tentative conclusion, based upon the most feasible explanation of the findings, is that increased muscular strength may be due to a type of learning which results from neurological, subcortical adaptation to imposed demands.

Microfilm \$2.50; Xerox \$15.10. 131 pages.

AN EXPERIMENTAL STUDY OF CERTAIN MEASURABLE FACTORS THAT MAY AUGMENT THE LEARNING AND TRANSFER OF MOTOR SKILLS OF FIFTH AND SIXTH GRADE BOYS

(L. C. Card No. Mic 60-1073)

Alvin Marvin Pettine, Ed.D.
University of Colorado, 1959

Supervisor: Professor Hubert H. Mills

This experimental study was undertaken to determine the relationship between specific practice in the development of basic physical attributes (strength, coordination, agility, balance), and obtained scores in complex sports activities by boys in the fifth and sixth grades. The need for the study stems from the fact that in many elementary schools the classroom teacher is responsible for all phases of the school program, including physical education. Review of the literature indicates that few elementary teachers are qualified to teach more than simple group games because of the pre-service education requirements set by colleges and universities. Research revealed that attention has been concentrated on the

junior-senior high schools and college levels. There is a need for more experimental study at the elementary level, particularly grades four, five, and six.

The study was conducted as an experiment, using two unmatched groups: a control group and an experimental group. Eighty-nine fifth and sixth grade boys of the Boulder Public Schools were used for the study. Two fifth grade and two sixth grade classes, of 47 boys, were designated as a control group and four classes, of 42 boys, were designated as an experimental group.

Prior to the experiment, a pilot study was conducted 1) to select tests for a test battery to be used in the experiment and 2) to help establish a specific program of activities to be used with the experimental group. The test battery was confined to the following measures and tests: 1) age, 2) weight, 3) grip strength, 4) pectoral strength, 5) Johnson test, 6) Sargent jump, 7) basketball throw for distance, 8) football throw for distance, and 9) softball throw for distance.

On September 16, 1958, the test battery was administered to each group as a pre-test. Five months later on February 18, 1958, a post-test was administered to each group to establish achievement made by either group. Scores obtained on the two tests were tabulated, and differences for each boy were recorded, as well as the net differences between groups. The statistical problem was that of evaluating the change of difference shown by the experimental group compared to the change shown by the control group. "t" scores and their corresponding levels of confidence were computed for each of the factors included in the test battery. The analysis of variance with co-variance adjustments between the means of each test was computed to compensate for pre-experimental differences between groups, since no attempt was made to obtain matched pairs.

"t" scores significant at the .001 level of confidence were obtained for the Johnson test, hand grip test, basketball throw, football throw, and softball throw. A "t" score at the .05 level of confidence was obtained for pectoral strength while weight and Sargent jump showed no significant differences under the conditions of this experiment. Therefore, the null hypothesis can be rejected. It may be said that there is a significant difference between the two groups as a result of the experimental factor.

Certain main conclusions were drawn from this study.

1) The results indicate that there is a positive transfer between the learning and practice of basic physical attributes and obtained scores in complex activities by boys used in this experiment. 2) Maturity alone will not automatically result in specific skill or motor development by children. However, a physical education program adapted to the level of ability and interest of children can significantly increase skill and strength. 3) Significant differences between the two groups were the result of most boys in the experimental group undergoing a positive change, rather than large gains made by a few individuals.

Microfilm \$2.50; Xerox \$7.60. 165 pages.

THE LIFE AND PROFESSIONAL CONTRIBUTIONS OF WILLIAM GILBERT ANDERSON, M. D.

(L. C. Card No. Mic 60-1208)

Harold Lloyd Ray, Ph.D.
The Ohio State University, 1959

Educators need to understand the phases through which all areas of education have progressed in the United States. If a profession's problems are to be placed in proper perspective, its heritage must be comprehensible. One approach is to investigate the deeds, personalities and creativity of its trail blazers.

This study is concerned with one leader--William Gilbert Anderson--who was, among other things, directly responsible for founding the organizations now known as (1) the College Physical Education Association and (2) the American Association for Health, Physical Education and Recreation. Anderson has not received the acclaim due him for his (1) fifty years of teaching, (2) fight for status for physical education, and (3) experimentation in this field. Similar studies have been made of the life and work of Dudley A. Sargent, Clark Hetherington and R. Tait McKenzie. It seems fitting that William Anderson should be recognized with these outstanding educators.

The purposes of this study are to (1) investigate Anderson's contributions in terms of their effect on the teaching profession; (2) set forth his personal philosophy by objectively analyzing his writings and the reports of contemporaries; (3) present a realistic picture of the life of this human educator contrasted against the times in which he lived; and (4) consummate a meaningful research project of value to future educators.

This research is based on sources pertaining to Anderson's private life, education, teaching, inventions and experimentation. The Yale Memorabilia Collection provided sound data, and additional research was conducted at Chautauqua Institution, the Library of Congress, Adelphi College, and the Ohio State University.

In an attempt to investigate the personality of this American educator-physician, interviews and correspondence with living contemporaries were sought to lend authenticity to the study. Long-time residents of Chautauqua supplied valuable background. Men like Robert Kiphuth, George Weber, and Wallace Clark--all associated with Yale University--were interviewed in New Haven. Albert Sharpe, former Yale athlete and Cornell coach, was interviewed at Chautauqua.

This treatise attempts to portray the gentlemanly, well educated, articulate Anderson. He traveled extensively in this country and in Europe, studying management techniques, teaching methods and facilities. His seven degrees included the M.D. and D.P.H. He devoted nineteen years to Chautauqua's summer school, and founded and supervised summer schools all over the United States. His career included experiences as a physician, teacher, administrator, lecturer and organizer. His life served as an example of the concept of Right Living.

Anderson started teacher education schools at Adelphi, Yale, and Chautauqua. His high standards for neophyte teachers were carried throughout the country by his students. In America he was an early proponent of preventive medicine, and espoused the cause of "minor" sports. He invented corrective apparatus and carried on experimentation at Chautauqua, Yale, and such unlikely places as the

slopes of Mexican mountains. He helped to popularize music and dance as intrinsic parts of the physical education curriculum. To him, motivation, the teachable "attitude," and a preventive approach to discipline were essential. Involved in the "battle of the systems" in America from the 1880's to the 1920's, Anderson was a liberal eclectic who set forth his views to those who would listen. His ideas were stated in a humorous, cogent manner in articles, texts and addresses.

Dr. William Anderson's long and interesting life ended July 7, 1947, in New Haven, Connecticut.

The study does not pretend to be a complete analysis of this unusual and rather overlooked personality. However, the professional heritage of physical education may be better understood through the life of this pioneer.

Microfilm \$2.80; Xerox \$9.70. 214 pages.

THE CONSTRUCTION AND VALIDATION OF MEASUREMENT PROCEDURES FOR THE COLLEGE PROGRAM OF PHYSICAL EDUCATION FOR MEN

(L. C. Card No. Mic 60-1111)

Curtis Roy Rylander, Ph.D.
New York University, 1959

The Problem

The purpose of this study is to construct and validate measurement procedures for the required instructional program of physical education for men. It is proposed that the measurement procedures be constructed as rating scales, based on degrees of descriptiveness which are defined in relation to the rating situation. The basic assumption underlying this study is that program planning in physical education in terms of broad and general categorical ratings of students' needs is a necessary procedure, as it is not possible for the teacher to utilize the more highly standardized instruments in measuring all the objectives of the program.

Procedure

In order to be able to construct the desired measurement procedures, it became necessary to (1) determine the objectives of the college program of physical education for men, (2) determine the activities to be included in this program, and (3) study and apply the principles of rating scale construction to the observable action traits established for each of the components of the objectives, which were then listed as the elements to be rated in the rating scales constructed.

Results of the Study

Eighty-three objectives of the college program of physical education for men are identified in a study of twenty-six sources of the literature in this specialized field which is current and now in use. A program of activities logically related to these objectives, and recommended to be included in this program by selected authorities, consists of seventy-four activities. This activity

program constitutes the frame of reference for the process of translating the objectives into observable action traits or experiences.

Fifty-six criteria and principles for rating scale construction and use are identified, and then studied and applied to the action traits established for each of the objectives identified. As a result, sixty-four rating scales are developed for measurement of the objectives of the college program of physical education for men. Only those objectives whose action traits are observable in the rating situation are included in the scales. Each rating scale is constructed as a descriptive graphic rating scale, consisting of five defined intervals. Instructions to the rater regarding the use and scoring of the scales is presented.

The validity of the rating scales is considered as inherent within the devices, since their use as rating devices involves observable performance in the trait itself. In addition, the theoretical validity of the scale for each objective is demonstrated through documentation, by showing that the action traits do occur, and occur in the continuum indicated.

Conclusions

On the basis of the evidence presented, (1) the rating scales developed in this study, for the measurement of the objectives of the college program of physical education for men, are adequate for determining student needs for program planning in terms of broad and general classifications, (2) the scales constructed meet the specifications of a sound scale, and (3) the action traits being rated are significant in the setting in which the students are to be rated.

Application

The rating scales may be applied at any time during the physical education class period, and without taking time away from the instructional program. Information thus obtained about the students' needs would then be used to plan the program. This information may also be used for motivation, guidance, or classification purposes.

Recommendations

Although armchair methods of devising measuring instruments for the rating of the objectives of the college program of physical education for men represents a valid starting point, further study of the recommended procedures should be carried out under laboratory conditions. This should be accomplished in a study in which the operational validity of the techniques developed would be examined under actual conditions.

Microfilm \$4.40; Xerox \$15.55. 344 pages.

**A STUDY OF THE RELATIONSHIPS BETWEEN
THE GOALS OF PHYSICAL EDUCATION AND
HIGHER EDUCATION: WITH IMPLICATIONS
FOR THE ACHIEVEMENT OF THESE GOALS
AT THE UNIVERSITY OF WICHITA.**

(L. C. Card No. Mic 60-1086)

Gladys Martha Taggart, Ph.D.
New York University, 1959

The plan of this investigation may be divided into two major sections. The first section is the process of seeking goals. The second is the application of goals through opportunities for experience.

The goals sought were statements of aims or objectives in Physical Education which are compatible and consistent with the goals of Higher Education.

Goals of Higher Education

A study was first made of philosophies of education, particularly as they apply to Higher Education. Although there are wide divergences in the various schools of thought, some consistency may be found among the statements of aims. When a survey was made of statements of goals for Higher Education by college administrators, committees, and commissions, a few goals emerged as essential and basic.

Without developing vocational aims, which are diverse, and by being concerned with general education, two principal kinds of aims emerged. First were those concerned with the development of the individual, the precious unit indispensable to the democratic concept, the personal aims. Second were those concerned with the development of man as he related to other men, the social aims.

Briefly, the personal goals are developmental, the preparation of the person to lead the "good life." They include health, essential skills and knowledges, the development of intelligence, reasoning, and value judgements. The social goals relate also to understandings, and the development of a sense of responsibility for human welfare.

Goals of Physical Education

Goals of Physical Education were found to be, improvement of fitness, physical, emotional, and mental, the development of movement skills, the ability to handle the body as an efficient tool in work and play, and the social and ethical goals. The social and ethical goals include skills and understandings of games, sports, dance, constructive and creative recreation, and the ethical practices inherent in and desirable for satisfactory group activities.

Both sets of goals are validated by the criteria developed by Jensen, that they be consistent, compatible, non-contradictory, possible or attainable, and have implication for fulfillment by means proposed.

The investigation indicates that the goals proposed for Physical Education are contained within the goals of Higher Education and equally valid.

Application of Goals

The second major section of the study is the operational aspect of these goals through opportunities for

experience. Surveys were made of typical experiences in Physical Education as provided by colleges, and opportunities through local facilities and organizations for experience in recreational skills.

Characteristics of the specific situation in a selected University were studied by examining the community, the school, and their close interrelationship.

Finally, a list of implications was drawn up, based on opportunities for achieving the selected goals, within the situation. The goals of Physical Education were compared with existing opportunities and implications were drawn as to how the University might augment or emphasize existing areas of desirable experience.

Specific recommendations included increased emphasis on swimming, a year-round club-type intramural program, an orientation program to include physical fitness testing and guidance and exploration for selecting a personal program of activities.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

EDUCATION, PSYCHOLOGY

**THE USE OF HUMAN FIGURE DRAWINGS
IN EVALUATING CHILDREN AND
ADOLESCENTS OF SPECIAL EDUCATIONAL
AND CULTURAL BACKGROUND:
AN EXAMINATION OF THE EFFECTIVENESS OF
CURRENT DIAGNOSTIC CRITERIA WITH THE
DRAW-A-PERSON TEST AS APPLIED TO
PUERTO RICAN CHILDREN AND ADOLESCENTS.**

(L. C. Card No. Mic 60-1081)

Max Bolotin, Ph.D.
New York University, 1959

The purpose of this research was to determine whether the DAP-Test can be interpreted in the same manner with both Puerto Rican and native-American subjects. That is to say, whether currently accepted diagnostic criteria for this instrument identify the same form and extent of pathology when they are applied to these two groups who differ significantly in their experiential and cultural background, as well as frequently in the extent and effectiveness of their previous education.

The subjects studied were children and adolescents of lower middle-class socio-economic background, who ranged in age from ten through seventeen years. The two native-American groups studied differed in their clinical condition, so that one group consisted of normal subjects, while the other was composed of previously diagnosed schizophrenics. Both Puerto Rican groups studied were composed of normal subjects who differed in the length of time they had been in America when they were evaluated with the DAP-Test. Accordingly, the newly-arrived group consisted of subjects in America less than two years, while the resident group was composed of subjects who came to America prior to school-age, and hence, who received their education entirely in the New York City School System.

Fifteen diagnostic criteria gleaned from the literature

were found to encompass a broad variety of theoretical assumptions underlying the interpretation of the DAP-Test, and also comprised the most frequently identified schizophrenic indicators on this test. Two clinical psychologists, thoroughly experienced with Machover's method for identifying schizophrenia with this test, independently rated every set of drawings on each of these fifteen criteria, using a four-point scale. This scale ranged from a judgment of "conclusively schizophrenic" to one of "definitely not schizophrenic."

An analysis of variance was used to test the first two hypotheses in this study. The first of these sought to determine the diagnostic validity of the DAP-Test for identifying schizophrenia within the native-American population. The obtained findings indicated that this test was successful in distinguishing between the normal and schizophrenic native-American groups at better than the .05 level of confidence. In testing the second hypothesis, it was found that the DAP-Test was incapable of differentiating between this same schizophrenic group and the newly-arrived normal Puerto Rican group at anything even approaching the .05 level of confidence.

The third hypothesis sought to determine the effect of acculturation upon the misdiagnosis of schizophrenia with the DAP-Test. The .05 level of confidence was required here. Eta (η), the correlation ratio, was applied, and revealed that acculturation and diagnosed schizophrenia were inversely related to a statistically significant degree. That is to say, as the normal Puerto Rican subjects became more fully acculturated, they were less prone to being misdiagnosed schizophrenic with the DAP-Test when they were not.

While the findings obtained from a qualitative analysis of these drawings were not quantified and, hence, are not offered as validated, such findings are highly instructive. It was observed here that the drawings of native-Americans as a group conform to recognizable social stereotypes in our culture, while those of Puerto Ricans are characterized by a primitiveness which readily identifies them as clearly deviant. Further, among all the normal groups, "schizophrenic indicators" appeared most often in the drawings of the newly-arrived Puerto Rican group. However, the frequent differences in how these features were handled by this group, in comparison to the schizophrenic group, suggests that these overtly similar features may well identify quite different inner processes within the members of these two groups.

Microfilm \$2.50; Xerox \$7.40. 157 pages.

THE RELATIONSHIP BETWEEN THE WECHSLER-BELLEVUE SCALE AND HIGH SCHOOL ACHIEVEMENT

(L. C. Card No. Mic 60-817)

J. Chandler Campbell, Ph.D.
Indiana University, 1959

Chairman: Louis Schmidt

Students were referred to the BOCES Guidance Center in Katonah, New York, by the school counselors in the ten schools in Northern Westchester County. Students were

referred for educational, vocational, or psychological appraisal. The Wechsler-Bellevue Scale for Adolescents and Adults, Form II, was used at the Guidance Center to infer subsequent scholastic achievement.

The purpose of this investigation was to determine the relationship which actually existed between scores obtained on the Wechsler-Bellevue Scale, Form II, and the subsequent high school achievement of students thus tested.

The data consisted of Wechsler-Bellevue subtest weighted scores and I.Q.'s and the end-of-the-year course grades for the 1956-1957 school year of the students thus tested. An analysis of these data resulted in the following conclusions:

1. Wechsler-Bellevue performance scale I.Q.'s gave some indication of subsequent achievement in shop (0.69) and home economics (0.49).

2. Wechsler-Bellevue verbal scale I.Q.'s gave some indication of subsequent achievement in social studies (0.48), English (0.46), foreign language (0.42), science (0.41), and mathematics (0.39).

3. A student's Wechsler-Bellevue verbal scale I.Q. and full scale I.Q. gave some indication of his subsequent grade point average, $r = 0.50$ and $Eta = 0.60$, respectively. The fact that the relationship between verbal scale I.Q. and grade point average (0.50) was significantly greater than was the relationship between performance scale I.Q. and grade point average (0.32) suggested that the functions measured by the verbal scale were the significant ones in both academic and non-academic subjects.

4. The performance scale measurement did, however, add something to the over-all relationship, for the relationship between full scale I.Q. and grade point average was very slightly greater than was the relationship between verbal scale I.Q. and grade point average in the case of (a) all subjects, (b) boys only, and (c) girls only.

5. The relationships between Wechsler-Bellevue scores and subsequent high school achievement were quite similar to those previously determined between individual intelligence test scores and school achievement at various levels.

6. Although the relationships herein determined were positive and statistically significant, they were not significantly greater than the relationships previously determined between paper and pencil intelligence test scores and school achievement. It could not, therefore, be stated that the use of Wechsler-Bellevue scores allowed more valid inferences to be made concerning subsequent scholastic achievement than did paper and pencil intelligence test scores.

7. The relationship between intelligence, as measured by the Wechsler-Bellevue Scale, and scholastic achievement was positive. This relationship, however, was not great enough to warrant the conclusion that intelligence test scores and school grades were the result of identical factors.

8. Wechsler-Bellevue performance scale I.Q.'s were more significantly related to subsequent grade point averages in the case of girls than in the case of boys.

9. The Comprehension, Picture Completion, and Arithmetic subtests, and the Similarities subtest to a lesser extent, showed a relatively high relationship to the grade point average. That three of these subtests were from the verbal scale emphasized again the importance of verbal or linguistic ability as far as scholastic achievement was concerned.

Microfilm \$2.50; Xerox \$6.40. 135 pages.

THE RELATIONSHIP OF SEVERAL SELF-OTHER INDICES TO CLAIMED AND MEASURED INTERESTS OF VOCATIONAL HIGH SCHOOL SENIORS

(L. C. Card No. Mic 60-913)

Harley Duane Christiansen, Ph.D.
University of Minnesota, 1959

The purpose of this study is to gain more information about the process of identification and its relationship to expressed and measured interests. To accomplish this purpose, two general problems have been examined: 1) Is there an underlying self consistency which generalizes to both the broader self (personality) and the vocational self (vocational role and interests) and can an indirect manifestation of this consistency be measured? 2) Are measurable differences ascertainable in the individual's attitudes and feelings toward workers in occupations which are related to his interests and vocational experience? To investigate these general problems, nine items of data were collected from 175 metropolitan vocational high school male seniors in three testing sessions spread over one month. Two items of data dealt with interests: 1) The Minnesota Vocational Interest Inventory (MVII), an empirically derived measure of similarity of interests to skilled tradesmen in twenty occupations and 2) an independent ranking of these twenty occupations giving a measure of expressed interests. The remaining data included seven self-other measures of identification derived from a specially constructed 20-scale semantic differential similar to scales suggested by Osgood. Each subject used copies of this differential to describe: 1) his self image 2) his ideal, an adult worker he admires, 3) his highest inventoried occupation 4) his lowest inventoried occupation, 5) his highest chosen or ranked occupation, 6) his lowest chosen or ranked occupation and 7) his trade major occupation.

Several cross comparisons of these differentials were made using Osgood's D formula. Identification was operationally defined as small differences between semantic differential check-list descriptions. Spearman rhos between the two interest data items were used to measure interest consistency. The Mann-Whitney U test and the Wilcoxon T test were used to test nine hypotheses related to two general problems mentioned earlier. The results indicate that broad self consistency and interest consistency were not significantly related, but that there were significant (alpha .05) predictable differences in the relationship of the individual's self and ideal worker images as they related to his images of high and low interest occupations and his trade occupation. These results indirectly support the Carter-Super vocational identification theoretical structure.

Microfilm \$3.25; Xerox \$11.50. 252 pages.

THE APPROPRIATENESS OF FIELD AND LEVEL OF VOCATIONAL CHOICE AS RELATED TO SELF-CONCEPTS, INTELLIGENCE, SCHOOL ACHIEVEMENT, AND SOCIOECONOMIC STATUS.

(L. C. Card No. Mic 60-559)

Paul D. Fairweather, Ph.D.
University of Southern California, 1960

Chairman: Professor Carnes

The purpose of this investigation was to measure the relationships existing between selected interpersonal and intrapersonal variables and the appropriateness of twelfth grade male students' field and level of vocational choice. Intrapersonal variables selected for study were stated in terms of the following self-concepts; the self-self ideal concept, the self-mother ideal concept, and the self ideal-mother ideal concept. Interpersonal variables investigated included intelligence, school achievement, and socioeconomic status.

Vocational choices were elicited from students by means of a questionnaire. Judges rated the appropriateness of the choices according to the appropriateness of both the field and the level of choices on a five-point rating scale. Self-concepts were measured by use of the Q-sort technique. Students sorted self-referent statements three times to represent the three selected aspects of the self-concept. Discrepancy scores for differences in the placement of statements for each combination of Q-sorts were obtained. Correlation coefficients between the Q-sorts were ranked and correlated with the ranked ratings made by the judges of the appropriateness of students' choices. Significance of the relationships was determined by means of the chi-square. Intelligence, school achievement, and socioeconomic status were correlated with the judges' ratings to ascertain their relationships to the appropriateness of choice. Chi-squares were computed to test the statistical significance of the coefficients obtained.

Findings. Statistically significant but moderate correlation existed between the appropriateness of field and level of choice. Appropriateness of field of choice was found not to be related to any of the variables employed. Appropriateness of level of choice was found to be related to the self ideal-mother ideal concept, intelligence, school achievement, and socioeconomic status. Students with a high degree of correlation between the self ideal and the mother ideal, students with high intelligence, and students in the upper socioeconomic classes made more appropriate vocational level choices than students in the lower categories. Inappropriate choices of low achievers were over-aspirant, while those of high achievers were underaspirant. Self-concept correlations in combination with intelligence, school achievement, and socioeconomic status were found not to be useful as a multiple predictor to identify students who would make appropriate field choices. Correlations between the self ideal and mother ideal concepts used in combination with intelligence scores, school achievement scores, and socioeconomic status showed promise for use as a multiple predictor.

Conclusions. Twelfth grade students who select appropriate vocational field goals tend to select appropriate vocational level goals, but the relationship is moderate enough to indicate that different variables influence ability

to choose an appropriate field from those that influence ability to choose an appropriate level. The self ideal-mother ideal concept is related to the appropriateness of twelfth graders' vocational aspiration level, but is not related to the appropriateness of field of vocational choice. Intelligent students and students in the upper socioeconomic classes tend to make more appropriate occupational level choices than do students with low intelligence or low socioeconomic status. Neither intelligence nor socioeconomic status is related to ability to make more appropriate field choices. High achievers tend to underaspire when their choices are inappropriate, while low achievers tend to overaspire. Appropriateness of second choice is not related to any of the experimental variables employed. A multiple predictor of appropriateness of field of vocational choice employing the variables used in the study is not considered practical, while the possibility of a multiple predictor for appropriateness of level of vocation indicates promise.

Microfilm \$2.80; Xerox \$9.90. 216 pages.

**A COMPARISON OF THE DEPTH AND RANGE
OF KNOWLEDGE AND INFORMATION ABOUT
THE INDIVIDUAL CHILD IN THE CLASSROOM
POSSESSED BY DEMOCRATIC AND
AUTHORITARIAN TEACHERS**

(L. C. Card No. Mic 60-1098)

Helen E. Tomson Grand, Ph.D.
New York University, 1959

In recent years, the general trend in evaluating teaching effectiveness has been largely in the direction of considering the personality of the teacher. Knowledge about the individual child in the classroom is also considered an important adjunct to education. The idea of reconciling and relating these two major trends stimulated the formulation of this investigation.

One approach to personality analysis has recently been that of distinguishing between democratic and authoritarian personality. This study applied this form of analysis to teachers in the attempt to evaluate what the teacher disposed toward democratic procedures and the teacher disposed toward authoritarian procedures knows about the individual child in his class.

Research into the education of the child, as it focused on child psychology, teacher personality and teacher-pupil relationship, emphasized knowing the whole child as a physical, intellectual and social being. The famous and comprehensive study of "The Authoritarian Personality" by Adorno and others (1950) demonstrated the interrelationship of personality dynamics and ideology. Previously, the Lewin, Lippitt and White experiments (1939) were the first to demonstrate that emotional reactions of children and their patterns of social interaction varied with the type of leadership.

Based on "The Authoritarian Personality" mentioned above and on other research, the present study attributed certain rigidly conventional and anti-intracception qualities to the authoritarian teacher while the democratic teacher was considered to utilize introspection, be more flexible and relate better to others.

Three measures were used to elicit two extreme groups of personality pattern among 160 fifth and sixth grade teachers of twenty-three schools in metropolitan New York. These were:

The F Scale--an opinion survey

The Wrightstone Scale--requiring direct observations in the classroom

A Principal's Judgments Form--constructed by the investigator.

A composite score of the three measures was obtained for each of the 160 teachers. The top ten per cent, 1 man and 15 women, constituted the extreme authoritarian group from which 13 were selected for intensive study. The bottom 10 per cent, 8 men and 8 women, composed the other extreme of democratic teachers from which 12 were selected for special study. Average age was 51.1 for authoritarian teachers and 27.6 for the democratic group.

During three weekly spaced one-hour sessions, each of the 25 classes included in the intensive study was given the SRA Junior Inventory, the Classroom Social Distance Scale, "Guess Who" techniques and a questionnaire to elicit various items of information about each child. Also during each session, the teacher was given a questionnaire to obtain the same items of information about 10 randomly selected children in the classroom. Additional information was gathered from medical and cumulative record cards.

The fifty items of information had to be reduced to 27 and were classified as:

Intelligence and Achievement Status

Health and Physical Factors

Personal-Social Feelings and Adjustment

Family Situation and Relationships

These 27 items were subjected to statistical analysis by the methods of proportion, product-moment correlation and "t" tests for significant differences. Fourteen items emerged as statistically significant and all favored the knowledge of the democratic group. Such results indicated that the democratically disposed teachers knew more about the individual child in the classroom and were consequently more effective.

Age differentials imply that men and women with more democratic personality structure have recently been attracted into the teaching profession. Even more careful screening of teacher candidates is recommended to locate democratic personality types and to divert extremely rigid authoritarian types to other fields. Small group in-service courses are suggested which concentrate on developing better self-understanding, better awareness of children's emotional needs and of the nature of the interaction between teacher and pupil.

Microfilm \$3.05; Xerox \$10.60. 235 pages.

ROLE DEFINITION AND CONSENSUS ON CERTAIN BEHAVIORAL TRAITS OF CRITICAL THINKING

(L. C. Card No. Mic 60-5323)

David Michael Heinlein, Ed.D.
Rutgers University, 1959

Critical thinking has emerged from educational research as a most important integrative concept. It has been accepted by many educational institutions as one of their major objectives.

This is an experimental study whose purpose is to apply the techniques of role analysis to certain consensuses on those behavioral traits of critical thinking which may be assumed by students and observed by faculty, parents and peers as these traits are in action within the culture of the school. The present study is designed to explore the following question:

Will group consensus on those items pertaining to critical thinking, which are included in a recognized evaluation instrument, reveal that the behavioral traits defining this role be a function of: (a) the behavioral obligations which students accept for themselves to exhibit the characteristics of critical thinking; (b) the behavioral expectations which faculty, parents, and peers hold for students to exhibit the characteristics of critical thinking; and/or (c) the interaction position which students occupy within the culture of the school as they perform the role of critical thinking?

EVALUATION INSTRUMENTS	PURPOSE OF INSTRUMENT
1. Form for Evaluating General Education Programs in Terms of Behavioral Outcomes. Russell Sage Foundation, 1957.	1. To motivate and focus attention on the elements of critical thinking contained in Part 1 of this form. All groups respond on this.
2. Behavioral Goals Indicative of Intellectual Development (64 selected items judged to have some relationship to intellectual development by 90% of a professional research group). Russell Sage Foundation, 1957.	2. These evaluative standards represent the 64 role definition items which are assumed to define the role of critical thinking. All groups respond to these items on a 5 category continuum from <u>Absolutely Must Do This</u> to <u>Absolutely Do Not Do This</u> . A mean and variance is calculated for each group on each item. Groups are compared by the median test and group-items by chi-square

STATISTICAL CALCULATIONS. The mean, variance, and chi-square calculations were made on IBM equipment in the Rutgers Computation Laboratory in cooperation with F. G. Fender, director.

Role analysis, after Neal Gross at Harvard, is approached from two viewpoints: (1) Intraposition analysis in which each group expresses its definition of the role of critical thinking by sorting the role definition items according to degree of acceptance (mean responses), and degree of consensus (variance responses). (2) Interposition analysis in which each group expresses its definition of the role of critical thinking through their interaction with the other groups. Three groups (faculty, parents, and peers) constitute the "field" of action with which the

student group interacts. Interaction is expressed in two ways: chi-square for significance on each item (between the "field" and the student group), and consensus within the field (combined variance responses) and within the student group (variances responses).

ANALYSIS OF INTRAPOSITION

Intraposition analysis from the 64 role definition item instrument. For each group on each item the mean indicated the average response category as absolutely must, probably should, or may or may not. Similarly, the variance indicated the group consensus which was either low or high, i.e. above or below the median consensus score. The items were sorted by category and by consensus (c) for each group as follows:

	Absolutely Must	Probably Should	May or May Not
Faculty	25 items, high c	7 items, high c	-
Parents	25 items, high c	7 items, high c	-
Peers	14 items, high c	18 items, high c	-
Students	9 items, high c	22 items, high c	1 item, high c

Intraposition analysis, role sector description. A role sector is a set of role definition items applied to the occupants of a position by the occupants of a different position. For example, the student group role obligations may be compared with the faculty group role expectations. The median test was applied to the four groups in order to detect any significant difference between the distribution of both the mean responses and the variance responses.

The following table may be read for the results of the median test of the group distributions of the

	Means			Variances		
	Parents	Peers	Students	Parents	Peers	Students
Faculty	non sig.	non sig.	sig. .01	non sig.	non sig.	sig. .01
Parents		sig. .01	sig. .01		non sig.	sig. .01
Peers			non sig.			sig. .01

Generalization of intraposition analysis: Each group characterizes the role of critical thinking differently. The faculty and parents appear to be equally demanding of conformance on the role traits, while the students and peers feel less obligation to conform, expressing themselves strongly in the "probably should do" category. The student role sector of critical thinking traits has a significantly different distribution of variances from the distribution patterns of the parent, faculty, and peer groups.

ANALYSIS OF INTERPOSITION

Interposition analysis from the 64 role definition item instrument. For the "field" group, the responses of the faculty, parents, and peers were condensed into two categories:

- (1) "accept" this role position = "absolutely must" category; and
- (2) "probably should accept" this role position = sum of other categories.

Similarly, the student responses were condensed to two categories. This process yielded a 2 x 2 table for each item, on which a chi-square was calculated, the level of significance being indicated at .05. 32 items were found to have significant differences at the .05 level.

The role definition items were then classified according to consensus within the groups, and according to whether or not there is a significant difference between the groups on the chi-square test. This classification follows:

Chi-square	High-H or Low-L consensus Within Each Group; Students-S, Field-Fd				Total
	HSHFd	HSLFd	LSHFd	LSLFd	
Significant	15	2	3	12	32
Non-significant	9	6	3	14	32
Total	24	8	6	26	64

This summary table was analyzed by the chi-square statistic with the following result: $\chi^2 = 3.65$, with 3 degrees of freedom, non significant at .05 level. Conclusion: The role definition position which the students hold is independent of their consensus.

Generalization of interposition analysis: The interaction of the student group with the combined faculty, parent, and peer group field is one which indicates that the two groups independently choose a significantly different pattern of role definition items in order to describe critical thinking behavior. Further study of the students' role definition indicates their inconsistency in defining their role.

CONCLUSIONS

1. The student body does not accept a more mandatory obligation to exhibit the behavioral traits of critical thinking than either the faculty, parent, or peer group expect them to accept. The order of mandatory expectations is: 1. Parents, 2. Faculty, 3. Peers, 4. Students.

2. The student body expresses a greater degree of consensus on the behavioral traits describing critical thinking than do either the faculty or peer groups. (Range of variance: students 1.14, peers 1.25, faculty 1.56).

3. The student body expresses a lesser degree of consensus on the behavioral traits describing critical thinking than the parents. (Range of variance: students 1.14, parents 1.03).

4. The student body characterizes its role of critical thinking differently from the role characterization expected by either of the faculty, parent, or peer groups. (Median test: significant at .01 level).

5. The student body characterizes its role of critical thinking differently from the characterization expected by the combined faculty, parent, and peer group on 50% of the items; and their "field" definition of the role is not related to their degree of consensus on the behavioral traits. ($\chi^2 = 3.65$, with 3 degrees of freedom, non significant at .05 level).

RECOMMENDATIONS

In the present study Gross' method of role analysis provides a means of examining the macroscopic consen-

suses regarding critical thinking behavior held by students, faculty, parents, and peers. The data suggest that a microscopic analysis of the role be explored by proposing a series of hypotheses such as: The higher the student's score on a test of critical thinking the greater will be the number of "absolutely must do" responses he will make on the Behavioral Outcome Evaluation Form. Other hypotheses relating to intelligence, sex, values, and social class might also be tested.

The present study was limited to a college preparatory school population. A similar study might be made of the population of a comprehensive high school.

Microfilm \$2.50; Xerox \$8.40. 184 pages.

EXPERIMENTAL COMPARISON OF WRITING-SPEAKING VERSUS SPEAKING-WRITING SEQUENCES IN LEARNING PAIRED-ASSOCIATES

(L. C. Card No. Mic 60-827)

Maurice Kessman, Ph.D.
Indiana University, 1959

This study investigated variables of sequences of learning and mode of presentation of stimulus materials in the independent study of second-language vocabulary. It relates to the development of a tested methodology for utilization of new educational media and techniques in self-instructional situations.

Problem. The primary problem was to investigate sequences for learning the speaking and writing of second-language vocabulary when the object was to learn both to speak and write this vocabulary under self-instructional conditions.

Method. The dependent variable, number of trials to reach a criterion, was measured as a function of the following independent variables: (1) order of learning the second-language performances of speaking and writing; (2) order of presentation of languages; (3) mode of presentation of the stimulus term. Comparisons were made between learning

- (1) first to speak and then write the response term and learning first to write and then speak the response term (Learning Order)
- (2) to respond with an English word to a "Foreign" word stimulus and learning to respond with a "Foreign" word to an English word stimulus (Language Order)
- (3) when the stimulus term is visually presented and learning when the stimulus term is auditorily presented (Mode of Presentation)

Subjects were presented with seven paired-associate items (English words and paralogues simulating foreign words). These items were presented in a mixed order on each trial until subjects reached a criterion of two consecutive trials on which all seven responses were correct. Subjects' responses to the stimulus terms were immediately

reinforced with the correct response term. Information as to the correct written response was presented visually while the information as to the correct spoken response was immediately presented auditorily.

The three variables, each varied in two ways, were incorporated in a $2 \times 2 \times 2$ factorial design yielding eight different conditions. Twenty high school students were randomly assigned to each condition for a total of 160 subjects.

Results. Analysis of variance showed significant differences beyond the .01 level for all three variables, with writing-speaking learning order, English-"Foreign" language order, and visual mode of presentation yielding the least mean number of trials to criterion. One interaction resulted: learning order \times language order.

Conclusions. The condition requiring a minimum number of trials, when the objective was to learn to both write and speak the "Foreign" words, was for writing to precede speaking and for the English stimulus terms to be presented visually. The condition requiring the minimum number of trials, when the objective was to learn to both write and speak the English equivalents, was for speaking to precede writing and for the "Foreign" word to be presented visually. Differences between the writing and speaking sequences for the latter objective were minor.

Microfilm \$2.50; Xerox \$5.00. 99 pages.

AN EVALUATION OF A SPECIAL CLASS FOR CHILDREN WITH A MILD NEUROLOGICAL IMPAIRMENT

(L. C. Card No. Mic 59-5023)

Ivy Pearson Mooring, Ph.D.
University of Southern California, 1959

Chairman: Professor Lefever

The public school is currently offering special classes with limited enrollments geared to the specific and specialized needs of physically handicapped children, but to this point has no facilities for the mildly neurologically handicapped child of average intelligence. The nature of the organic pathology makes adjustment hazardous for most of these children, so that their behavior and learning difficulties cause considerable disruption in the regular classroom.

The problem for this study was to evaluate whether neurologically handicapped children with average intellectual potential make more progress in academic skills and behavioral adjustments in small segregated special classes than do a similar group of children left in the regular classes, provided parents and teachers of both groups are given the same amount of knowledge concerning the child's problem and possible ways of helping him.

A small segregated class of eleven neurologically handicapped children, with average intellectual potential and no motor involvement, was established in the Palos Verdes School District. The State Department of Education agreed to finance the program for a two-year period under the same provisions already established for other physically handicapped children.

A group of children comparable in age range and ability remained in the regular classroom, and their progress was compared with that of the children in the special class. This contrast group of children was not established until the second year of the study, so that the changes in children in the special class could be compared with changes in the children in regular classes following one year of study only. The progress of the children in the special class was followed for two years and the findings presented in case study form.

The teachers for the regular class pupils received help in the techniques for teaching the neurologically handicapped child through workshops and case conferences in the same manner used to help the special class teacher. The parents of children in both groups attended regular monthly meetings, and both groups of children received the medication prescribed by one of the three physicians cooperating in the study.

Selected and devised instruments were used to analyze and compare growth for both groups of pupils in the areas of academic achievement, social maturity, and certain aspects of behavior together with pupil and parent attitudes.

Findings. The analysis of the differences in the mean gains for special and regular class children after one year of study indicated the following: (1) No statistically significant improvement in reading, arithmetic, and language skills was made by special class pupils over that of regular class pupils. (2) No significant improvements in visual-motor-perceptual development could be attributed to placement in the special class. (3) Significantly greater gains in certain aspects of social maturity were achieved by special class pupils than by the regular class pupils. (4) Significantly greater improvement in certain aspects of behavior were made by special class pupils than by the regular class pupils. (5) Parents of children in the special class showed a significant improvement in certain attitudes and feelings, including increased understanding and tolerance for their child's difficulties. This improvement in attitude was less evident in parents of regular class children. (6) Children in the special class demonstrated a significantly greater improvement in certain attitudes related to school than was exhibited by regular class children. (7) The intelligence test scores of both groups of children indicated a loss, especially in the vocabulary subtest of the verbal scale.

Conclusions. Difficulties in dealing with abstract concepts and disorders of visual motor perception, which appear to be characteristic of the neurologically impaired child, are not improved by segregation in small special classes and probably preclude successful achievement in academic skills.

A small segregated class in which stimulation is kept to a minimum appears to be highly beneficial for the neurologically handicapped child to assist him to inhibit certain undesirable aspects of behavior, to help him develop social maturity, and to improve his own and his parents' attitude toward himself and school.

Microfilm \$3.30; Xerox \$11.70. 256 pages.

**A STUDY OF THE RELATIONSHIPS OF
READING ACHIEVEMENT TO CERTAIN
OTHER FACTORS IN A POPULATION
OF DELINQUENT BOYS**

(L. C. Card No. Mic 60-944)

Harold John Rogge, Ph.D.
University of Minnesota, 1959

This study is designed to investigate the relationships of reading achievement to a number of intellectual, personality, and biographical factors in a population of adjudicated delinquent boys. In studies of delinquent boys, it has been observed that reading disability is quite common; on the other hand, when disabled readers are studied, delinquency is not so common. These two groups, however, tend to have similar profiles on certain tests. This investigation attempts to determine the extent to which certain measured or rated characteristics vary with reading ability, apart from their coincidence with delinquency.

The Gates Reading Survey, the Wechsler Intelligence Scale for Children, the Minnesota Multiphasic Personality Inventory in tape recorded form, and biographical data from case files were used to obtain information concerning 132 institutionalized delinquent boys between the ages of 14 and 16 years. Chi-square tests for independence are used on the biographical characteristics. Analysis of variance is used for the intelligence and personality data. The reading criterion is defined in two ways: by means of the reading quotient, and by means of the residual error score derived from the regression of reading on intelligence. The intelligence and personality variables are also included in a multiple regression analysis. The major null hypotheses in this study take the following forms:

1. There are no significant differences between able readers and disabled readers in:
 - a. Verbal IQ
 - b. Performance IQ
 - c. Full Scale IQ
 - d. Verbal greater than performance or performance greater than verbal tendency
 - e. Individual subtests of the intelligence scale
 - f. Individual scales of the personality inventory
 - g. Certain biographical factors such as race, religion, school grade, and home conditions.
2. When certain factors are taken in multiples and weighted according to their contribution, there is no significant increase in their predictive power in the estimation of reading ability.

When reading quotient is the criterion, the results indicate that the hypothesis of no difference between able and disabled readers in the areas mentioned is rejected for all of the intelligence scales and subtests, five of the personality scales (L, F, Hs, Sc, Es), and two biographical factors (Racial Origin and Grade in School).

When residual error is the criterion, the hypothesis of no difference is rejected for only four items: Information, Vocabulary, Social Introversion, and Grade in School. In the multiple regression analysis, the best estimators of reading achievement appear to be Information, Arithmetic, Vocabulary and Digit Span, with the first two accounting for most of the multiple correlation.

The major conclusion of the present study is that delinquent boys who are poor in reading ability tend to present a syndrome of general educational retardation which is not uniquely associated with any other personality, biographical, or intellectual characteristics studied. Of all the variables investigated, Information and Arithmetic, like reading, would appear to be most reflective of general educational advancement. These variables seem to cluster with one another, but to be relatively independent of other variables. Thus it can be said that the general profile for delinquents on the WISC and MMPI and on biographical characteristics tends to be stable and independent of reading ability when the latter is adjusted for regression on general (Full Scale WISC IQ) intelligence.

Microfilm \$3.25; Xerox \$11.50. 251 pages.

EDUCATION, RELIGION

**THE FUNCTION OF THE PARTICIPANT-OBSERVER
LEADER IN DEALING WITH ANXIETY
MANIFESTING AS PARATAXIC DISTORTION
IN THE GROUP LIFE OF THE CHURCH**

(L. C. Card No. Mic 59-5022)

George E. Koehler, Ph.D.
University of Southern California, 1959

Chairman: Professor Irwin

Christian education stands on the threshold of an era in which interpersonal relationships are seen as a chief medium by which salvation (making whole, salvus) is effected. A leadership concept is needed for the normative groups of the church, programing and educational groups, which will actualize the saving potential of these relationships in spite of the anxiety which distorts them.

The development of such a concept is based on an original theoretical method, the tripolar correlation of situation, message, and ministry, an adaptation of Paul Tillich's "method of correlation" for systematic theology. Social sciences contribute to the situation describing man's predicament and the existential question implied therein. Theology forms the message about the revelation which answers man's predicament. Christian education implements the ministry which links that question with that answer in the lives of persons. Like the others, the pole of Christian education theory is dependent in substance on only its own unique data. But in form it is dependent on the other two, anticipating and answering them.

Tillich shows the situation of man to be one of estrangement from his own true being, from others, and from God. Man has fallen from essential being into existential being. This is his sin as well as his destiny. The

threat of nonbeing, anxiety, which contributes to this separation, may be handled by despair, security operations, or courage. One of man's ubiquitous security operations is what Harry Stack Sullivan terms parataxic distortion and more orthodox psychiatrists, transference-countertransference: In the normative groups of the church, as elsewhere, situations are integrated partially on the basis of autistic self and other personifications in order to minimize anxiety, thus producing a parataxic (along-side-of) relationship. The existential question implied in this situation is that of the possibility and source of the courage to be (i.e., to accept nonbeing as anxiety into the self-affirmation), when anxiety distorts those relationships that might be sources for such a courage.

The answer to this question is New Being, essential being appearing, paradoxically, under the conditions of existence and conquering the gap between essence and existence. One's relationship with New Being is a revelation of being-itself, God, and is thereby saving. One is made whole across the estrangement of his existence from his essence. New Being is manifest in all of life but finally in Jesus as the Christ. However, the meaninglessness of our time and the Monophysitic distortions of this focal symbol have sapped it of its saving power for many.

A more compelling symbol may be found in the expression of New Being in the leadership, both designated and indigenous, of church groups. Those who are sinners in their anxious estrangement and, in particular, parataxic distortions, may also be saints, revealing being-itself and mediating salvation. Such a leadership is participant-observation, suggested by Sullivan's concept of the psychiatrist's role and a bolder approach to countertransference interpretation in recent psychiatry. Participant-observation is the relationship between two or more persons on the basis of the mutual communication of observations, i.e., awareness, judgment, and acceptance based on essential being, of the parataxic distortions whereby, in spontaneous, existential participation, their interpersonal situations are integrated. This mutual observation of mutual participation involves both a giving and a receiving side. It is participation (faith) in the divine participation (grace) and, in spite of judgment, acceptance (faith) of the divine acceptance (grace).

Thus, as participant-observation is implemented through a methodic procedure in the normative groups of the church and interpreted by the criterion of the ultimate expression of New Being in Jesus as the Christ, it is revelatory and saving, in courage, by grace, through faith.

Microfilm \$5.05; Xerox \$17.00. 396 pages.

EDUCATION, TEACHER TRAINING

PROFESSIONAL PREPARATION AND CURRENT PRACTICES OF ENGLISH TEACHERS IN THE NORTH CENTRAL HIGH SCHOOLS OF OKLAHOMA

(L. C. Card No. Mic 60-1241)

Clara Belle Hounshell Altaffer, Ed.D.
The University of Oklahoma, 1960

Major Professor: Gail Shannon

The unique position of the English teacher in the high school has directed attention to the preparation and training necessary for today's English teacher. Studies have been made of the preparation offered prospective English teachers in many of the colleges, but few of the studies have examined the preparation of a particular state's corps of English teachers. It is the purpose of this study to analyze the prevailing conditions during the first semester of the school year 1958-59 with regard to the professional preparation and current practices of selected high school English teachers in Oklahoma with implications for teacher education and curriculum improvement. One hundred forty-nine teachers from 96 high schools responded to the questionnaire sent to all English teachers in 163 high schools accredited by the North Central Association of Secondary Schools and Colleges.

Summary of Findings:

Teachers sampled were well prepared in terms of degrees; all had completed the baccalaureate degree; 67 per cent had earned or were working toward master's degrees; 2 per cent, toward doctor's degrees. Eighty-three per cent had a major or a minor in English; the average number of semester hours in English was 44; in education, 33. The average teacher had 6 semester hours in courses in the teaching of English. Less than half of the teachers had college credit in foreign languages, journalism, or library science; but two-thirds had credit in public speaking and in history. Less than half of the teachers belonged to the National Council of English Teachers; three-fifths belonged to the Oklahoma Council of Teachers of English, but nine-tenths belonged to the National Education Association and the Oklahoma Education Association.

The respondents taught an average of 135 students daily, spent approximately 30 hours per week in preparing for classes and grading papers, and spent an additional 8 hours each week in extra-curricular activities. Class loads, motivation of students, individual differences, and outside readings were identified as the most significant problems of the teachers included in the study.

Major Conclusions:

1. The teachers are well prepared in terms of degrees, in semester hours of English, and in semester hours in the teaching of English, but less adequately prepared in American literature, world literature, adolescent literature, grammar and composition, and in oral interpretation.
2. Oklahoma teachers of English cannot give the needed emphasis to their professional responsibilities in

teaching because of heavy class loads and many additional duties.

A major recommendation was that more attention to the teaching of reading, of spelling, and of writing and more attention to problems of student motivation and caring for individual differences should be given in the course in the teaching of English.

Microfilm \$2.95; Xerox \$10.35. 228 pages.

**DEVELOPMENT OF A PHILOSOPHY OF
ART EDUCATION FOR THE MASSACHUSETTS
STATE TEACHERS COLLEGES: A COLLIGATION
OF RECENT WRITINGS, RESEARCH STUDIES
AND PHILOSOPHY OF CONTEMPORARY
ART EDUCATION FOR THE STATE
TEACHERS COLLEGES OF MASSACHUSETTS.**

(L. C. Card No. Mic 59-6214)

Robert Louis Bertolli, Ed.D.
New York University, 1959

Chairman: Professor William P. Sears, Jr.

This study was undertaken to arrive at a comprehensive, defensible art education program for prospective elementary classroom teachers as part of their undergraduate courses at state teachers colleges. It was designed to result in motivating guide lines, and in content and methodology for the achievement of the desired objectives as these eventuated from the investigation.

The data were collected from the accredited state teachers colleges of the Eastern Arts Association and from elementary classroom teachers who received their training recently at these same colleges. These data were colligated with the concepts derived from the literature in the field and presented to a panel of persons competent in art education and related disciplines for approval and for suggestions.

The investigation concluded in the basic concept that creative art experiences are a requisite to the contemporary education of all persons whatever their ultimate educational goal. The values which were ascribed to such a program concerned priority concomitants in personal, social, cultural, aesthetic, psychological and philosophical categories.

The evidence indicated that these values may be educationally implemented through a comprehensive overview of the phases of art expression. These phases were disclosed to be:

a. **STUDIO** - in which the student works directly with the materials and processes of art. The orientation of the required studio experiences is to bring specific enrichment and cultural awareness to the individual as a person. The data indicated the desirability of an inclusive program of activities rather than one which specialized in a limited number of projects. A wide diversity of media and processes was recommended.

b. **CULTURAL** - in which art is treated as the qualitative record of civilization, concerned with man's operations upon his surroundings which divulge his values and

his aspirations. Requisite is a richness of interpretation, aesthetic and philosophical, designed to achieve appreciation and cultural understanding.

c. **PROFESSIONAL** - in which art is considered as an educational classroom experience with special values and during which the prospective teacher is concerned with the preparation of instruction aimed at the achievement of these values. The methodology of art education is so specialized and detailed in its scope, with such inseparable connections with the activities of doing, thinking and feeling, as well as with child growth and creative development, that it can be handled adequately only by a department of art education rather than as a segment of a general treatment of educational methods. Throughout this professional preparation, the enthusiasm and conviction necessary to carry the values of art education into the classroom should be stressed.

The consistent exercise of art judgment in purposeful creative activity is the basis of the recommended methodology in all courses. The procedures center around experiential activity vitalized by creative thought, personal reaction and individual conclusion. Creative thinking evolved as one of the foremost concerns of contemporary education.

Significant agreement was found between the objectives and values derived separately from the literature and those enumerated by the art educators involved in the investigation. Summarized, these are:

1. To introduce art as a constant factor in daily living for the individual and for the community.
2. To develop personal aesthetic enjoyment and judgment.
3. To foster the individual and social values inherent in creative thought and action.
4. To cultivate the enrichment of the personality through the art experience.
5. To exploit art as a dimension in the comprehension and use of knowledge.
6. To provide a needed means of non-verbal communication.
7. To increase competence in the handling of tangible materials.

The recommendations of the study were designed to make of art a coherent whole for the teacher and for his students. Microfilm \$2.50; Xerox \$8.40. 182 pages.

**AN EVALUATION OF THE UNDERGRADUATE
CURRICULUM IN AGRICULTURAL EDUCATION
AT SOUTH CAROLINA STATE COLLEGE**

(L. C. Card No. Mic 60-1171)

Marion Milford Caldwell, Ph.D.
The Ohio State University, 1959

Purpose

This investigation was concerned with an evaluation of the pre-service curriculum in agricultural education at South Carolina State College, Orangeburg, South Carolina. The study attempted to discover how well the total program of preparation for teachers of vocational agricultural

had served its functions. In more specific terms, the objectives were -

1. To determine the professional competencies needed by teachers of vocational agriculture.
2. To identify the strengths and weaknesses of the pre-service program.
3. To secure the attitude of graduates toward the profession of teaching and to determine their degree of satisfaction with agricultural education as their undergraduate area of specialization.

Methods and Procedures

After a comprehensive review of related studies pertaining to curriculum and evaluation, the following procedures were employed in conducting the study: (1) A jury of experts identified the "factors of competency a teacher of vocational agriculture should possess." (2) Teachers appraised their pre-service curriculum by use of a questionnaire. (3) Administrators appraised the preparation and competence of their teachers by an evaluation instrument. (4) The staff of the School of Agriculture appraised the total curriculum by an evaluation instrument.

Because of the nature of the problem, the location of the informants, the time and the conditions, the questionnaire and the personal interview were believed most appropriate techniques for collecting the data.

Findings and Interpretations

The staff of the School of Agriculture, administrators and teachers of vocational agriculture, all agreed that the curriculum in agricultural education at South Carolina State College should be improved. This improvement should be made by reorganization of the present curriculum. However, no major changes were indicated.

As a result of the analysis and interpretation of the data presented in this study, the writer arrived at the following conclusions:

1. Generally the staff of the School of Agriculture, the administrators and teachers of vocational agriculture, agreed to the factors of competency involved in the teaching of vocational agriculture.
2. Administrators believed that teachers of vocational agriculture were doing their work well.
3. The staff did not approve of a five-year program in agricultural education.
4. The staff, administrators, and teachers of vocational agriculture believed that more time should be allowed for practice teaching and that more technical agriculture courses should be required.
5. A majority of the teachers thought it preferable for student teaching to be done in two different schools.
6. Teachers and administrators indicated that the weakest phase of the curriculum was in the area of the farming program.
7. Teachers seemed to agree that subjects offered in the area of fine arts were of least value in preparing them to teach vocational agriculture.
8. The staff at the College believed that the major cause for transfers from the department was low income from teaching as compared with other work.

As a result of this study, the writer suggests that The South Carolina State College improve the effectiveness of the undergraduate curriculum for teachers of vocational

agriculture, and that the following recommendations be used as a guide:

1. A joint committee of the teacher education and supervisory staffs, with the approval of the institution and the State Department of Education, should conduct a study to devise ways and means whereby the student teaching period can be extended.
2. The teacher education and supervisory staffs should study the pre-service and in-service needs of teachers relative to the understanding of a good farm program, and to the areas of adult education, guidance, and counseling; and design ways and means of improving the preparation of teachers in these areas.
3. Greater emphasis should be placed on technical agriculture.
4. Effort should be made to improve the contribution of fine arts courses to the curriculum, or consideration be given to the elimination of such courses.

Microfilm \$3.25; Xerox \$11.25. 249 pages.

A STUDY OF THE PERCEPTIONS OF SENIOR STUDENTS REGARDING THEIR PRE-SERVICE EXPERIENCES AND THEIR PREPARATION FOR ELEMENTARY-SCHOOL TEACHING

(L. C. Card No. Mic 60-1114)

Philip John Cardina, Ed.D.
New York University, 1959

The Problem

This study explores the perceptions held by select groups of senior students regarding their pre-service experiences, how they learned to perform the key tasks of the teacher, and their perceptions of how well prepared for teaching they are. Findings suggest implications for improving teacher preparation through emphasis on "The Professional Tasks of the Teacher" as these are related to objectives of teacher education.

Procedures

An instrument for collecting data was developed in the combined form of questionnaire and check-list based upon the unpublished paper by Rath, the result of years of research, titled "The Professional Tasks of the Teacher." Rath suggests that these seem to be the major tasks of the teacher: (1) To inform; to explain; to "show how;" (2) To initiate; to direct; to organize; (3) To develop good classroom morale; (4) To clarify students' feelings, thoughts, aims, purposes, beliefs, interests, and attitudes; (5) To make group life more zestful and productive; (6) To develop closer relationships between the school and the community; (7) To seek the causes of behavior; (8) To evaluate and make reports; (9) To perform the necessary "housekeeping" duties; (10) To assume responsibilities associated with the wider setting of the whole school; and (11) To assume responsibilities associated with the teacher's professional and personal life.

Data were collected from groups of nine students from each of five different kinds of teacher preparation institutions in and near the New York metropolitan area.

Data were organized and presented in an extensive series of detailed tables. These were analyzed and interpreted in relation to the problem mentioned above.

Major Findings

Students value most the Task "To Seek the Causes of Behavior;" yet value least the Task "To Develop Closer Relationships Between the School and the Community."

Students seem to value most those Tasks which require a high degree of teacher-pupil interaction.

Students seem to value least those Tasks which involve professional experiences, relationships, and responsibilities outside the classroom.

Students' responses suggest that the methods which proved to be most helpful in learning to perform the suggested teaching procedures were, in this order, (1) seeing it done, (2) being taught this way in college, (3) doing it, (4) reading about it, and (5) hearing about it.

Students' direct experiences for the most part dealt with those Tasks which require a high degree of teacher-pupil interaction.

Students encountered fewer direct experiences which involve professional improvement, evaluation, making reports, relationships with faculty members, parents, or community relations.

Students feel they have been best prepared to perform the Tasks (1) To inform; to explain; to "show how;" (2) To initiate; to direct; to organize; (3) To develop good classroom morale; and (4) To perform the necessary "house-keeping" duties.

Students feel they have been satisfactorily prepared to perform the Tasks (5) To seek the causes of behavior; (6) To make group life more zestful and productive; (7) To assume responsibilities associated with the teacher's professional and personal life; and (8) To clarify students' feelings, thoughts, aims, purposes, beliefs, interests, and attitudes.

Students feel least prepared to perform the Tasks (9) To evaluate and make reports; (10) To assume responsibilities associated with the wider setting of the whole school; and (11) To develop closer relationships between the school and the community.

A series of ten implications for strengthening teacher preparation programs are included in the document.

Microfilm \$4.90; Xerox \$17.35. 381 pages.

SEPARATION FROM THE TEACHING PROFESSION ON THE PART OF TEACHERS EDUCATED AT CALIFORNIA STATE TEACHERS COLLEGE

(L. C. Card No. Mic 59-6543)

Richard Omar Davis, Ed.D.
University of Pittsburgh, 1959

The purpose of this study was to identify those teachers who had left the teaching profession after being subjected to the conditions of normal employment, to determine the characteristics of these teachers, and to determine their reasons for dropping out of the teaching profession.

The alumni records at California State Teachers College provided the names and addresses of all graduates. The classes which had been graduated during the years 1938 through 1954 were included in this study. Since the study was only concerned with teachers who had dropped out of teaching, a special letter, which accompanied the questionnaire, gave those who had never been regularly employed as teachers or who had been in continuous public school service the opportunity to exclude themselves from the study. In order to exclude themselves from the study, the teachers merely checked the reason for exclusion provided in the letter, and returned the unanswered questionnaire.

The questionnaire was constructed of the most frequent reasons given for dropping out of teaching as revealed in other similar studies. Repeated mailings of the questionnaire were made so that the responses of as large a percentage of the graduates as possible could be obtained. A random sample of the graduates who did not return questionnaires was contacted and interviewed.

Data gathered were set up in special tabular forms based on a weighted average system, in order to make possible a comparative presentation of the reasons for teacher dropout.

The typical woman teacher dropout was found to be married and the parent of one child. She had not attained the Master's degree. Her dropout from the teaching profession was made from one of the primary grades in an elementary school. This woman teacher had dropped out of teaching because of the need to rear her children.

The typical man teacher dropout was found to be married and the parent of two children. He had not attained the Master's degree. His dropout from the teaching profession was made from industrial arts teaching in a secondary school. The inability of the teaching salary to cover family obligations was the basic reason for dropping out of the teaching profession.

Teacher dropout groups tend to be made up largely of women. The majority of teacher dropouts are married. A married teacher dropout is usually the parent of at least one child. Most dropouts from teaching occur after only a few years of teaching service on the part of the teacher dropout. Most teacher dropouts occur in fourth-class school districts and in rural communities. Men teachers drop out of teaching because of salary inadequacies and women teachers drop out of teaching because of homemaking duties and care of children.

Microfilm \$3.05; Xerox \$10.60. 234 pages.

**A STUDY OF THE RELATIONSHIP OF
CERTAIN SELECTED CRITERIA AND
SUCCESS IN THE STUDENT TEACHING
PROGRAM AT CLARK COLLEGE,
ATLANTA, GEORGIA.**

(L. C. Card No. Mic 60-1064)

Pearlie Craft Dove, Ed.D.
University of Colorado, 1959

Supervisor: Professor Hubert H. Mills

The purposes of this study were: (1) to ascertain what relationships exist between certain selected criteria and success in the student teaching program at Clark College, Atlanta, Georgia, and (2) to formulate a selective admission plan for students entering the student teaching program at Clark College.

The subjects for the study were fifty-five student teachers at Clark College for the 1957-1958 school year. The criterion (student teaching success) was determined by the cooperative evaluation of student teaching performance made by the off-campus supervising teacher, and the college supervisor of student teaching. Seven criteria were selected for study. These included: (1) interest in and knowledge of contemporary affairs, (2) broad cultural background, (3) certain personal qualities, (4) attitude toward children, (5) intelligence, (6) scholarship, and (7) knowledge and understanding of children. Measures used to obtain indices of the extent the students met criteria selected for study were: tests, grade-point averages, and ratings in professional laboratory experiences.

Analyses of variance were made to test the significance of the relationships between the quality of student teaching, and scores on tests and grade-point averages. Chi-square was employed to test the association between the quality of participation for professional laboratory experiences.

The findings of the study were as follows:

1. There were statistically significant relationships between the quality of rated student teaching success and the following criteria:

- (a) Broad cultural background as measured by the Cooperative General Culture Test Form A.
- (b) Scholarship as measured by grade-point averages in general education, professional education, special fields, and cumulative college course work.
- (c) Knowledge and understanding of children as evaluated by the rating earned for participation in professional laboratory experiences.

2. No statistically significant relationships were found between the quality of rated student teaching and the following criteria:

- (a) Interest in and knowledge of contemporary affairs as measured by the Contemporary Affairs Test Form 1957.
- (b) Personal adjustment as measured by the Heston Personal Adjustment Inventory.
- (c) Attitude toward children as measured by the Minnesota Teacher Attitude Inventory Form A.

- (d) Intelligence as measured by the Otis Quick-Scoring Mental Ability Test Gamma Am.

3. The data provided by the study furnished useful information for proposing selective admission policies for the student teaching program at Clark College. A summary of the plan follows:

The criteria for admission to student teaching are: (1) effective communicative skills, (2) knowledge and understanding of the foundations of education, (3) physical health to meet the demands of teaching, (4) academic competence, (5) broad cultural background, (6) desirable personal qualities, and (7) knowledge and understanding of children.

Among the procedures for obtaining evidence of meeting the criteria are: (1) recommendations from the health staff, (2) appropriate measuring devices, (3) ratings by the staff members, and (4) interviews by members of the Teacher Education Committee.

The recommended, selective-admission plan at Clark College is administered by the Teacher Education Committee which will study the data relative to an applicant's status. When an applicant meets all the proposed minimum standards he will be permitted to enroll in student teaching. An applicant who has a minor deficiency in regard to one or more of the criteria will be admitted to the student teaching program on a tentative basis. However, a very serious deficiency in any one or more of the criteria will serve as the basis for denying admission.

Microfilm \$3.05; Xerox \$10.80. 236 pages.

**THE RELATIONSHIP BETWEEN THE TEACHING
SUCCESS OF FIRST-YEAR ELEMENTARY
TEACHERS AND THEIR UNDERGRADUATE
ACADEMIC PREPARATION**

(L. C. Card No. Mic 60-1121)

Wayne S. Hertz, Ed.D.
New York University, 1959

Supervisor: Professor Walter A. Anderson

This study was designed to determine the adequacy of the teacher education program by relating the teaching success of elementary teachers to educational experiences on the Central Washington College of Education campus. It was reasoned that certain teachers were more successful than others. If it could be determined who these teachers were, which of them were successful and which were not successful, a study of their preparation might lead to some positive conclusions about the program of teacher education at Central Washington College of Education.

The information needed to make necessary comparisons was secured by means of a questionnaire which was completed by the beginning teacher, a second questionnaire which was completed by that teacher's supervising principal, and by an analysis of the academic record through a study of the individual's transcript of grades. Of the 196 teachers included in the study, 157 returned questionnaires with the data completed. This represents a return of 80.1 per cent. One hundred fifty-one supervising principals answered questionnaires on the 157 first-year teachers for a 96.2 per cent return.

A number of conclusions of special significance to Central Washington College of Education were reached in this study:

1. Elementary prepared teachers teaching on that level had a clearer picture of elementary teaching responsibilities and requirements than did secondary prepared teachers who taught on the elementary level.
2. Students with academic records in the upper forty per cent of their class tended to do a better teaching job. However, this was not conclusive enough to be used as a single variable in the selection of teachers.
3. The professional subjects minor appeared to be a good preparation for elementary teachers.
4. The uncontrolled variables made it impossible to give an unqualified conclusion about the teacher education curriculum.
5. The criterion variable, the principals' ratings of first-year teachers, could not be considered completely reliable. The inconsistencies in the ratings, the lack of discrimination reflected in the ratings, and the principals' own admissions reflecting a lack of confidence in their ratings left one without any reliable criterion variable.
6. The low reliability coefficients between the independent variables and the criterion variable reflected the inadequacy of the criterion variable. The low correlation between the independent variables indicated the inconsistency in collective human judgments about any identifiable trait or quality.
7. A thorough study of the guidance and counseling practices on the Central Washington College of Education campus was conclusively suggested.
8. A serious study of the academic preparation needed for elementary teachers was strongly indicated.
9. The deficiencies accumulated in the areas of music, art, and physical education indicated that special consideration must be given to these areas of preparation.
10. The principal apparently did not observe or supervise any of his teachers sufficiently well to determine accurately their strengths and their weaknesses. Time to allow such supervision evidently does not exist.
11. There was little linear correlation between the first-year teachers' self-ratings and the principals' ratings of the beginning teachers.
12. The curriculum implications on the campus must be realistically studied by the teaching staff. It is apparent that the students are presently not capable of synthesizing the theory.
13. Teachers must be recommended for and placed only on the levels for which they are prepared, or in their areas of strength.
14. The practice of allowing a completely free selection of majors and minors by the students preparing to teach on the elementary level should be questioned.
15. The practice of predicting teaching success is hazardous. The variables used to furnish the data to make the prediction are not too reliable and there is little agreement concerning success in teaching.
16. Similar studies directed toward the secondary level might prove helpful.

Microfilm \$2.50; Xerox \$8.60. 189 pages.

ATTITUDES OF SECONDARY SCHOOL TEACHERS TOWARD VARIOUS ASPECTS OF THE AMERICAN MARKETING SYSTEM

(L. C. Card No. Mic 60-1186)

Evalyn Mary Hibner, Ph.D.
The Ohio State University, 1959

STATEMENT OF THE PROBLEM

The purpose of this study was to determine the attitudes held by secondary school teachers (both teachers of business education subjects and teachers of non-business education subjects) toward certain aspects of the American marketing system which are of prime importance to consumers and voting citizens in a democratic society. A list of marketing concepts of importance to consumers was to be compiled, and comparisons were to be drawn (1) between the opinions expressed by the entire group of teachers and the opinions of recognized experts in the field of marketing; (2) between the opinions expressed by business education teachers and those expressed by non-business education teachers; and (3) between the opinions expressed by business education teachers who had studied Principles of Marketing and the opinions of non-business education teachers who had not taken such a course.

PROCEDURES USED IN THE INVESTIGATION

From a review of related research, twelve categories of consumer concepts were identified; and a list of concepts in each category was developed from an analysis of marketing textbooks, supplemented by additional ideas contributed by recognized specialists in various areas of marketing. The concepts were used as the basis for the construction of an Inventory for the determination of the attitudes of secondary school teachers toward various aspects of the American marketing system, as evidenced by their expressed opinions.

Replies to the Inventory were secured from six hundred secondary school teachers, representing two hundred Business Education Teachers with Marketing, two hundred Business Education Teachers without Marketing, and two hundred Non-Business Education Teachers (without Marketing).

FINDINGS AND CONCLUSIONS

Identification was made of 108 marketing concepts of importance to consumers--concepts which should become a part of the general education of all secondary school students.

From the responses of the six hundred teachers, the following conclusions were drawn:

1. Secondary school teachers, as a whole, appear to be well informed on the basic concepts which comprise the following categories: Marketing Fundamentals; The Ultimate Consumer; Style and Fashion; Wholesaling; Consumer Buying; Marketing Costs, Marketing Efficiency, and Government Relationships.
2. Secondary school teachers, as a whole, appear to be relatively uninformed on a large number of the basic elements which compose the following categories: Retailing; Consumer Cooperatives; Advertising; Standardization

and Grading; Consumer Credit; Prices and the Price System.

3. Secondary school teachers, as a whole, appear to be particularly well informed about certain consumer marketing concepts since, on twenty items of the Inventory, more than 90 per cent of the respondents agreed with the opinions of the marketing experts.

4. Secondary school teachers, as a whole, are very poorly informed concerning certain consumer marketing concepts since, on sixteen items of the Inventory, less than 50 per cent of the respondents agreed with the opinions of the marketing experts.

5. Business Education teachers, as a whole, are better informed concerning various aspects of the American marketing system than are non-business education teachers. The difference between the two groups, however, is not an outstanding one.

6. Business Education Teachers with Marketing are much better informed concerning many aspects of the American marketing system than are Non-Business Education Teachers (without Marketing).

7. A course in Principles of Marketing is an effective means of developing in prospective teachers sound attitudes toward the American marketing system. Since business education teachers have a particular responsibility for the development of the economic education of secondary school students and since the attitudes of pupils tend to reflect the attitudes of their teachers, a course in Principles of Marketing should be included in the preparation of all business education teachers.

Microfilm \$4.75; Xerox \$16.65. 370 pages.

THE DOCTORAL PROGRAM IN EDUCATION AT THE UNIVERSITY OF COLORADO, 1941-1956.

(L. C. Card No. Mic 60-1074)

Willard Parker Riddles, Ed.D.
University of Colorado, 1959

Supervisor: Professor Edwin R. Carr

The problem undertaken in this study was to collect data from the doctor of education graduates of the College of Education at the University of Colorado which: 1) may be used as one basis for the evaluation of the doctoral program; 2) will provide data which may aid prospective doctoral students in making decisions in the selection of their programs and in answering many of their questions. Data for the study were accumulated from responses to a questionnaire mailed to all Ed.D. graduates of the University, University records, and personal interviews. Ninety-five per cent of the graduates contacted returned usable questionnaires.

The three major sections of the study concerned experiences of Ed.D. graduates prior to their work at the University of Colorado, during their doctoral work, and since receiving their degrees. In their evaluation of the Ed.D. program, respondents noted six features in which they considered the School of Education's program was noteworthy: 1) the areas of school administration and secondary education; 2) the professional reputation of Dr. Douglass and the staff; (3) the adherence to strict entrance

requirements; 4) the outstanding library facilities available at the University; 5) the availability of the Ed.D. degree; 6) a realistic foreign language requirement based on the individual's needs. Their expressed opinions also indicated apparent weaknesses in the program: 1) inadequate programs in elementary and higher education; 2) inadequate size of permanent staff, resulting in lack of time for individual work with candidates; 3) large size of summer session graduate classes; 4) lack of supervised teaching experiences at the university level.

Differences in degree requirements definitely influenced graduates in their choice of degree--lack of foreign language and clearly defined major and minor areas were considered important by graduates. The prestige value of the degree and the fact that most of them were going into college and university work also influenced their decision to take this professional degree.

Few graduates have secured publication of their dissertation materials. However, many of the studies are of interest only in a localized or specialized area, which might preclude their publication for a wider audience. It was also noted that most Ed.D. graduates do not actively enlist the services of the University placement office in obtaining their jobs. Many of these people are returning to positions they held prior to starting work on the degree, and others use the office only as a clearing house for references and occupational information. Throughout this report the respondents have indicated a high regard for the staff and the program with which they were connected. It was concluded that the School of Education has been very successful in developing its doctor of education program. Microfilm \$3.50; Xerox \$12.15. 270 pages.

TRENDS IN THE EDUCATION OF MATHEMATICS TEACHERS: A STUDY OF THE EDUCATION OF SENIOR HIGH SCHOOL MATHEMATICS TEACHERS IN SELECTED TEACHER EDUCATION INSTITUTIONS IN THE UNITED STATES IN THE PERIOD 1920-1958

(L. C. Card No. Mic 60-1112)

John Abraham Schumaker, Ph.D.
New York University, 1959

The purposes of the investigation were to trace the development of programs for the education of teachers of senior high school mathematics during the period from 1920 to 1958, to determine trends in the evolution of curricula with emphasis on the mathematical content, and to suggest recommendations for future practices. Subordinate problems were the determination of differences in trends among teachers colleges, state universities, and other teacher education institutions and the identification of any apparent reasons for changes in the curricula. Certification requirements and the professionalization of subject matter courses were also studied.

A questionnaire was sent to the heads of mathematics departments in the 314 members of the American Association of Colleges for Teacher Education whose 1957-58 catalogues showed that they had programs for preparing senior high school teachers. The 140 institutions selected for the study included those of each type that graduated

the largest numbers of mathematics teachers in 1957 in each state. Catalogue data were secured for these schools for six academic years extending from 1920-21 through 1957-58.

In 1920-21 elementary mathematics through calculus was almost universally offered and the usual advanced courses were differential equations, theory of equations, history of mathematics, advanced calculus, and solid analytic geometry. The teaching major had to meet a median minimum requirement of twenty-four semester-hours of mathematics, including the usual courses through calculus plus others that most often included solid geometry, differential equations, and theory of equations. The median minimum requirement for the minor was twelve semester-hours of mathematics and that of professional courses for the prospective teacher was twenty-one semester-hours.

Over the entire period the most widely offered advanced course was differential equations; but college geometry, offered in 1920-21 by only one-sixth of the schools, showed the most consistent increase and was offered in 1957-58 by four-fifths of the institutions. Theory of equations, mathematics of finance, and elementary statistics also showed steady increases. By 1957-58 the median semester-hour requirements had increased to twenty-seven for a major, eighteen for a minor, and twenty-four in professional courses. There was little difference in requirements among the three types of institution. College geometry came to head the list of required advanced courses by 1936-37 and was required by 32 per cent of the institutions in 1957-58, the highest per cent to require any course beyond calculus in any of the years.

Recommendations for teacher education curricula that were made by mathematics educators during the thirty-eight year period were strikingly consistent, although college geometry was the only advanced course recommended as a requirement by all of the principal groups. There was, however, an absence of specific evidence of the influence of committee reports and other factors on changes in teacher education curricula, and an indication that these factors had little direct effect. Many of the proposed programs represented practice already in effect in a majority of the institutions included in this study.

Many of the recommendations for courses such as statistics and mathematics of finance in teacher education curricula were based on the changed character of the secondary school and its mathematics. Other courses, especially college geometry, were directly related to secondary school courses. The relatively stable nature of senior high school college-preparatory mathematics was reflected in the similarity of the various proposed programs for teacher education.

The findings of this study indicate that the relevance of proposed changes in teacher education curricula to the mathematics of the secondary school will be a major determining factor for the adoption of present and future proposals. The adoption of a new course beyond calculus as a requirement in the majority of the teacher education institutions is unlikely under the continued operation of factors present during the period covered by the study.

Microfilm \$4.00; Xerox \$13.95. 310 pages.

AN ANALYTICAL STUDY OF THE VARIOUS HOME ECONOMICS EDUCATION CURRICULA IN SELECTED LAND-GRANT COLLEGES OF THE NORTH ATLANTIC REGION

(L. C. Card No. Mic 59-3444)

Mabel Sidell Spencer, Ed.D.
The American University, 1959

It is the purpose of this study to determine and analyze the curriculum requirements in home economics education of twelve selected land-grant colleges and universities of the North Atlantic region of the United States.

Specifically and in respect to the twelve programs, the study is designed to answer the following questions:

(1) What is the status of home economics education as determined by placement in the institution, enrollment, level of entrance to the curriculum, degrees conferred, and faculty? (2) What is the nature of curricula in home economics education as determined by a study of formal programs? (3) What are practices in respect to the student teaching experiences? (4) What are some characteristics of home economics education students in respect to quality, motivation, and employment?

A preliminary study was made of the catalogs to determine what kind of information which was uniform for all twelve institutions, could be secured from these publications. A determination was then made of additional items of information which needed to be secured. These items then became components of a formal questionnaire, which was sent to teacher educators in the twelve institutions.

A variety of findings were obtained in this study, some of which are as follows:

The relationship of home economics enrollment to total number of women in the institution constitutes from six per cent to thirty-one per cent of total undergraduate women enrollees. The home economics education curricula enrolls from seven per cent to seventy-one per cent of the total home economics population.

Students may enter the home economics education curriculum varying from the freshman through the senior year.

There are various deviations in faculty-student ratio. The ratio varies from five faculty to forty-one students to one faculty to seventy students.

General education, subject-matter or special education, and professional education showed considerable variation. The range in general education was from twenty-nine to fifty-six semester hours; subject-matter or special education gave a range of thirty-seven to fifty-nine semester hours; professional education showed more similarity of range. This range was from eighteen to twenty-six semester hours.

The number of electives varied greatly. The total unrestricted electives for the four year program represented a range of three to twenty-four semester hours.

Student teaching requirement is usually from six to nine weeks in duration and this teaching may be done in laboratory schools, local public schools, and off-campus schools (some distance from campus).

Supervising teachers receive some type of remuneration for their work with student teachers.

This study indicates that fifty-six per cent of all students prepared to teach home economics do so; as many as twenty-five per cent seek other employment.

Some of the conclusions derived from this study are as follows:

Further study is needed in the area of home economics education.

Analysis of the home economics education curricula is needed in land-grant colleges and universities of other regions of the United States.

The home economics education curricula should be developed so as to harmonize with each institution's particular goals and objectives, yet have some similarity.

Many of the isolated areas should be combined so as to develop a broad area of concentration.

The home economics education curricula should allow for more undesigned electives.

Less emphasis should be given to the so-called skill areas.

The physical and biological science requirements should be reevaluated and more emphasis be given to the social sciences and humanities.

The curricula should provide offerings in home economics that may be elected without burdensome prerequisites, thus encouraging the student to make home economics a part of general education requirement.

Microfilm \$2.50; Xerox \$8.60. 189 pages.

**TEACHING CHILDREN IN THE CHURCH SCHOOL:
A STUDY OF TEACHING METHODS AND
PROCEDURES AMONG VOLUNTEER TEACHERS
OF THE EVANGELICAL LUTHERAN CHURCH.**

(L. C. Card No. Mic 60-1051)

Elaine Miriam Tracy, Ed.D.
University of Colorado, 1959

Supervisor: Professor H. H. Mills

This study was undertaken to make an appraisal of teaching methods in use among volunteer teachers of The Evangelical Lutheran Church. Procedures were examined in the light of accepted curriculum practice, child growth and development, learning principles, and method. The procedures used in the study involved an intensive review of literature, conference interviews with prominent religious educators, the development and distribution of two questionnaires, presentation of assembled data, drawing conclusions, suggesting problems for further study, and making recommendations. One questionnaire was sent to seventy-eight authorities in religious education; all responded. A second questionnaire was sent to Lutheran church school teachers and Protestant directors of religious education. A total of 357 teachers, or 89 per cent, and 275 directors, or 91 per cent, responded.

The interviews with the experts not only gave perspective and direction to the study as to the way the church sees its teaching ministry but they established the fact that there is a uniqueness about Christian education, and they laid the foundation for the construction of both questionnaires. The purpose of Questionnaire I, An Evaluative Instrument, was to ascertain the best theory of which the church schools are capable of putting into practice. The investigation sought to determine whether acceptable principles of curriculum were applicable to parish educa-

tion, whether principles of growth and development were the same for Christian education as for secular education, whether criteria on how children learn were relevant to the church, and whether the same methodology practiced in public schools could be used in the church. The authorities were in agreement over the relevancy to the church of the selected principles in all four areas.

The purpose of Questionnaire II, A Study of Teaching Methods, was to determine the kinds of teaching methods that directors of religious education believed should be in use by church school teachers, as well as to discover those which actually are in use by the teachers. In an effort to learn some of the reasons for teachers teaching the way they do, a series of "opinion statements" were attached to the questionnaire.

The research evidence indicated that (1) from the standpoint of educational theory, church schools do not differ markedly from secular education, but the church is not as progressive as the public school in use of knowledge concerning growth and development, curriculum practice, methods, and learning principles; (2) the authorities have not yet found very effective methods of helping teachers meet their problems; (3) present teacher education institutes are not adequately meeting needs; (4) lack of teaching time and professional leadership pose serious problems; (5) present departmental arrangement (pre-school, primary, junior, intermediate) is ineffective; (6) home and family are not being used sufficiently in providing learning experiences; (7) Lutherans tend to be more conservative in their opinion on many principles of church school teaching than do non-Lutherans; (8) effective methods in teaching and effective religious experience on the part of the pupils go together; (9) there is lack of evidence as to when certain concepts should be introduced; (10) there is a positive relationship between what teachers believe about church school teaching and the way they teach; and (11) the curriculum should provide for a common body of educational experience plus those additional experiences essential in meeting interests and needs.

On the basis of the findings it is recommended that the church give consideration and study to the content and over-all structure of an adequate and meaningful in-service-training program; that improvement in parish education at the congregational level be made through the development and use of evaluative criteria; and that a basic source book for church school teachers be provided.

Microfilm \$4.10; Xerox \$14.40. 318 pages.

**AN ANALYSIS OF THE STRENGTHS AND
WEAKNESSES OF THE TEACHER EDUCATION
PROGRAM AT BRIDGEWATER COLLEGE,
BASED UPON A FOLLOW-UP INQUIRY OF
GRADUATES OF THREE CONSECUTIVE YEARS.**

(L. C. Card No. Mic 60-1285)

Frederick Francis Wampler, Ed.D.
University of Maryland, 1959

Supervisor: Dr. L. Morris McClure

This follow-up study was designed to provide one basis for an evaluation of the teacher education program

at a small, church related liberal arts college. The problem of the study was to discover the opinions of recent teaching graduates of the college regarding their experiences at Bridgewater College as preparation for teaching, and to discover the opinions of the employers of these beginning teachers regarding the strengths and weaknesses of the teaching graduates of the college.

A review of recent studies using a follow-up method was undertaken, as well as a review of literature regarding the experiences and content of a good teacher education program. From the latter, twenty-four criteria were developed as being appropriate for a teacher education program in a small private liberal arts college. These criteria were used to assist in structuring the interview schedule.

The interview was chosen as the means for gathering the greatest proportion of the data of the study, and two interview schedules were developed, one for use with the graduates, and the other for use with the employing principal. Additional data were gathered from the records of the college.

The population of the study was confined to the teacher education graduates of the classes of 1955, 1956, and 1957 who were teaching in 1957-58 within the geographical area of Virginia, West Virginia, Maryland, Delaware, and the District of Columbia. A total of fifty-one out of fifty-four graduates who met the population definition participated in the study, as did their forty-five principals.

The data were organized in relation to nine specific questions regarding such aspects of the college program as the guidance service, the area of general education, the fields of specialization, the professional core courses (including student teaching), the placement services at the college, out of class activities, and also regarding community, cultural, and professional activities at the time of the interview.

Conclusions reached by the study were that the guidance and placement services given by the college could be improved in terms of better publicity of their services, as well as by improved organization of the former. Also, while the areas of general education and of specialization were considered of great value by a majority of the recent teaching graduates, two-thirds of these graduates felt their professional core courses (excluding observation and student teaching) had been of only some value to them. A definite need existed in this area for more discussion, class participation, and practical experience in the classes in the area, and for more attention to the methods of teaching specific subjects.

Observation and student teaching experiences were considered of great value by a majority of the interviewees, but there were additional needs for more actual teaching experiences, more experience with administrative routines and the keeping of records and for additional conference time with the critic teacher at the school.

Other conclusions were drawn relating to the level of scholarship of the recent teaching graduates, the extent of present participation in professional, cultural, and community activities, and the areas of major difficulties in teaching.

Recommendations for further study and action were made to the faculty of the college in the final part of the study.

Microfilm \$3.25; Xerox \$11.50. 251 pages.

THE ROLE OF THE PUBLIC SECONDARY SCHOOL IN THE GENERAL AND OCCUPATIONAL PREPARATION OF YOUTH ENTERING SKILLED AND SEMISKILLED JOBS IN THE MANUFACTURING INDUSTRIES.

(L. C. Card No. Mic 60-720)

Charles Vincent Youmans, Ed.D.
University of Kentucky, 1955

More specifically than the subject reveals, the study attempted to determine the secondary school's aims and objectives, its functions and responsibilities, and the services it should provide for the general and occupational preparation of youth entering industry on the skilled and semiskilled levels.

The Purpose

The purpose was to establish the principles thought to be valid in designing and operating occupational preparatory programs in the public secondary school.

Method of Study

Two methods of research were used:

1. Library research, to find the prevalent philosophies relating to the educational and occupational preparation of youth entering the skilled and semiskilled occupations of industry.

2. A questionnaire in a national survey, to get the judgments of certain qualified juries as to the relevancy of these philosophies for designing and operating appropriate public secondary school programs for these youth.

The four juries were:

1. Training directors associated with the manufacturing industries and members of the ASTD.¹

2. Industrial educators who are members of the NAITE.²

3. General educators who are members of the ASCD of NEA.³

4. Education and research directors of labor organizations affiliated with the A. F. of L.⁴ and C. I. O.⁵

Over 600 respondents answered the questionnaire; 1500 survey instruments were distributed.

Findings and Interpretations

Over 90 per cent of the total-sample group believe that the secondary school has an important function and responsibilities for part of the occupational preparation of youth entering the skilled and semiskilled occupations of industry.

For youth entering the skilled jobs, the school, according to the total response, should provide preparatory instruction in some "Family of jobs." For youth entering semiskilled occupations, the school should provide instruction in skills and knowledge that are of general use in industry. The findings do not imply that any one program or pattern of occupational preparation would be appropriate for all youth entering industry.

Neither a purely general education program nor a school program limited to the occupational preparatory offerings is supported by the findings of this study. Both

general and occupational preparatory offerings are essential as side-by-side offerings in the school.

The findings confirm these services as appropriate for youth entering industrial jobs (In order of relevancy for youth entering skilled work):

1. Vocational guidance and counseling
2. Off-work-hours extension courses for young workers
3. Occupational information courses
4. Prevocational exploratory courses
5. General industrial education courses
6. Coordination services to help youth to make the school-to-work adjustments
7. Vocational education-preparation toward general occupational competency
8. Placement services - especially in communities where no state employment services exists
9. Specialized occupational preparation for one job or part of a job is a borderline school service for youth entering skilled work. It is not a valid school service, according to this study, for youth entering semiskilled occupations

School patterns of occupational preparation are ranked high among the patterns of training, but not significantly higher than some other patterns in which the school has little or no function. The full-time day-trade school pattern was ranked first on its merits for preparing youth as skilled workers. The cooperative pattern was ranked second and by a large number of persons. "Improved apprenticeship" was third.

All juries, except the training directors, ranked the cooperative pattern first in merit as a training pattern for youth entering semiskilled work. General industrial education was ranked second and the full-time day-trade school pattern third, for preparing these youth as workers.

The findings support the cooperation of the school with industry in providing related instruction for apprentices. The findings emphasized the need for more cooperation among all agencies active in the occupational preparation of youth. Respondents designate the secondary school as the best coordinating agency for the over-all occupational preparation of youth for skilled and semiskilled work in industry.

The study reveals strong support of the democratic ideology which provides for freedom and mobility in the school and society for persons to rise to their highest potentials. Microfilm \$3.55; Xerox \$12.40. 275 pages.

1. American Society of Training Directors.
2. National Association of Industrial Teacher Educators.
3. Association of Supervision and Curriculum Development of the National Education Association.
4. American Federation of Labor.
5. Congress of Industrial Organizations.

EDUCATION, THEORY AND PRACTICE

THE IN-SERVICE NEEDS OF ARIZONA PRIMARY CLASSROOM TEACHERS TO TEACH MUSIC

(L. C. Card No. Mic 60-1031)

Eldon Allen Ardrey, Ed.D.
University of Colorado, 1959

Supervisor: Professor Hubert H. Mills

This study was an investigation of the in-service needs of Arizona primary classroom teachers to teach music. Relative strengths and weaknesses were ascertained from ratings on forty-two musical competencies grouped under seven activity categories, namely: singing, reading, listening, rhythmic, instrumental, creative and general factors.

Self-rating check lists were developed for the purpose of collecting information from a stratified random sample of primary classroom teachers. Eighty-four per cent replied and eighty-one per cent of the returns were usable.

Rating schedules were also used by music supervisors and the writer to rate selected groups of teachers. The items used were identical to those printed on the self-rating list. Each of the thirteen supervisors rated a minimum of three teachers. The writer rated fifty-eight.

A fourth set of data was collected from a jury of music experts and used to indicate emphasis the selected teacher competencies should receive in pre-service training.

Teachers were found to be generally capable in Singing Activities, but lacked confidence to pitch songs and to understand children's voices.

Teacher abilities to conduct Music Reading were adequate. Although evaluations of rating groups were divergent, the teachers and the writer agreed on weaknesses in determining relationships between melody line and chord structure, and ability to use syllables or other adequate reading approach. Lack of teacher confidence in the latter weakness was believed to stem from musicians' historical disagreement on "best method" ... "solmization" versus rote-song.

Rhythmic competencies of teachers were generally satisfactory. All rating groups were in agreement on weaknesses. Composite calculations supported these agreements. Weaknesses were as follows: ability to use simple rhythm instruments, and to use folk songs with units of study. Inability to use simple instruments was noted also in another phase of the study.

Teachers were confident and capable in the most significant Listening Activities. They were confident of possessing personal musical sensitivity and in their ability to make effective use of text, music and story to enhance imagery for children. There was agreement by all rating groups on two weaknesses, namely: effective listening opportunities for children to hear selves and other children, and playing familiar music for children.

Teachers' estimates on ability to conduct Instrumental Activities were very low on all items. All self-ratings were 2.42 or below. Composite calculations of all rating groups were 2.89 and lower. Satisfactory ratings were above 3.10.

Most Creative Activities were rated low by classroom teachers. Self-ratings were 2.73 and below. A weakness

in assisting pupils to create new songs and song texts was listed among the lowest by all rating groups.

A General Factor category was used when unsatisfactory classification seemed unavoidable. Teachers, with one exception, scores 2.92 and above. The lowest item (2.26) was ability to use broad community and school resources.

It is concluded that some types of teacher growths in music are better accomplished and upgraded in service. Regular supervisor guidance and extension work are needed.

The music expert jury adjudged the chief functions of pre-service training to be: development of broad understanding in what music can do for children, and training personal musical capital of the prospective teacher so that she may experience successful musical activities prior to teaching children.

Microfilm \$4.00; Xerox \$14.20. 312 pages.

**PROBLEM-SOLVING: A COMPARISON OF THE
EXPRESSED ATTITUDES WITH THE
CLASSROOM METHODOLOGY OF SCIENCE
TEACHERS IN SELECTED HIGH SCHOOLS.**

(L. C. Card No. Mic 60-1169)

Thomas Gibbons Aylesworth, Ph.D.
The Ohio State University, 1959

The basic problems of this study were concerned with the attitudes of classroom teachers of science in Michigan toward problem-solving as a worthy objective of the teaching of science, with the methodology used in the direct teaching of this method as described by a selected group of science teachers in Michigan, and with the actual methodology used by this group. The preliminary investigation was one of observing and tape recording a series of twenty classes in science in selected Michigan high schools of various sizes and in various science areas. Notes were taken and methodology was scrutinized and equated with a check list by Obourn on the problem-solving objective. The teachers of these twenty classes were given a copy of the questionnaire following the observation. The questionnaire consisted of two parts: the first dealing with the size of school, the teachers' backgrounds in the courses taken in both science and science education, their years of experience, and their schedule of classes; the second, asking for their reaction to Obourn's forty-four points, indicating whether they practiced this activity in the classroom "always," "almost always," "occasionally," "seldom," or "never."

The returned questionnaires from these twenty teachers were compared with the observed and tape-recorded activities found in the classrooms, and it was concluded that the questionnaires had been filled out realistically, inasmuch as the results tallied with the observation form that was used. The questionnaire was then sent to one hundred and ninety-four teachers of science in the state of Michigan, and the one hundred and forty-two returns were tabulated in total, by size of school, by number of science areas studied by the teachers, by number of science education courses taken by the teachers, by years of experience, and by area of instruction. The total percentages were almost identical with the total percentages of the observed group,

and in a division into the above-mentioned categories, little change was found in the basic percentages.

The results, essentially, were that science teachers indicated that the forty-four check list items were done in their classrooms "always," by 4 per cent; "almost always," by 32 per cent; "occasionally," by 47 per cent; "seldom," by 16 per cent; and "never," by 1 per cent. The conclusions were that (1) the various items of background of the teachers caused the ultimate percentage of frequency of the activity to change very little, (2) not enough attention was being given by these teachers to the direct teaching of problem-solving, and (3) although they stated that they approved of problem-solving as an objective of science teaching, the teachers were not fully cognizant of the necessity for the direct teaching of problem-solving.

Microfilm \$2.50; Xerox \$5.80. 116 pages.

**AN EVALUATION OF LEARNING EXPERIENCES
ESPECIALLY DESIGNED FOR THE TEACHING
OF WORK-STUDY SKILLS AT THE
FIFTH GRADE LEVEL**

(L. C. Card No. Mic 60-894)

Norman Robert Babcock, Ed.D.
University of Kansas, 1959

In this study the author has developed and evaluated a "Handbook for Teaching Work-Study Skills" which provides many desirable learning experiences designed for the teaching of work-study skills at the fifth grade level. In order to put this handbook to use, sixteen teachers in four school districts in Northeast Johnson County, Kansas, agreed to use the handbook in their fifth grade classes during the 1958-59 school term.

The Iowa Every Pupil Test of Basic Skills, Work-Study Skills Sections, Form L, was administered in September, 1958, by the author to pre-test the 410 pupils. Each pupil was provided a copy of the handbook. Most of the teachers made maximum use of the handbook for teaching a particular skill when the need for learning of the skill by the pupils was most apparent.

Early in January, 1959, the investigator administered the Otis Quick Scoring Test of Mental Ability to obtain an intelligence quotient score on pupils in the experimental classes. The writer visited all the sixteen experimental classes during the 1958-59 school term and determined that all the sixteen teachers were utilizing the handbook in teaching work-study skills in their classes. Teachers and pupils alike seemed enthusiastic about the material provided by the writer.

During the latter part of April, 1959, the author administered the Iowa Every-Pupil Test of Basic Skills, Work-Study Skills Section, Form M, to all groups as a post-test.

Calculations for the t test revealed that all classes except one had gained a significant amount in work-study skills during the seven-month period of instruction.

The author compared each of the sixteen experimental classes on the pre-test, post-test, and Otis Intelligence Test by application of the Z test. All but three of the groups had mean raw scores on the post-test which placed the group significantly above the national norm.

The remaining three groups had mean raw scores which did not differ significantly from the national norm.

Teachers marked approximately 81% of all items checked in the "yes" column of the handbook evaluation instrument. This marking indicated that the teachers believed the handbook to be quite an adequate resource for teaching work-study skills.

After using the handbook, the pupils indicated by checking of a self-appraisal instrument that:

Forty-nine per cent of the pupils believed they used work-study skills "quite satisfactorily." Thirty-six per cent of the pupils believed they used work-study skills "about average." Fifteen per cent of the pupils believed they were "not too good" in using work-study skills.

Although all sixteen of the groups were considered experimental groups and there were no control groups for comparative purposes, the data would seem to indicate, despite the obvious superiority of ten groups in intelligence and two groups in the pre-test, that the significant gain from pre to post-test for fifteen of the groups must in part be attributed to the method used in the study.

From the views expressed by the sixteen teachers of experimental groups in a handbook evaluation instrument and validated by test data, it is reasonable to conclude that the handbook was an adequate and effective resource for teaching work-study skills at the fifth grade level.

From the opinions gathered from a pupil's self-appraisal instrument, it was apparent that a large majority of the pupils believed they had learned to use work-study skills to a satisfactory degree.

As was revealed in this study, it is possible to improve the work-study skills of boys and girls through the use of learning experiences especially designed for the teaching of work-study skills.

Microfilm \$2.65; Xerox \$9.25. 202 pages.

AN EXPLORATION OF AN APPROACH TO INSTRUCTION DESIGNED TO FACILITATE THE USE OF PROBLEM-SOLVING IN MEDICAL-SURGICAL NURSING

(L. C. Card No. Mic 60-1066)

Elizabeth Clare Giblin, Ed.D.
University of Colorado, 1959

Supervisor: Associate Professor Harold Anderson

It was the purpose of this study to find out whether a unit on symptomatology, which emphasized the interrelationship of the patho-physiology and the rationale for the treatment and nursing care, had any potential value for helping nursing students make better use of scientific principles in a problem-solving approach to the nursing needs of actual patients who manifested certain symptoms. A problem-solving test, based on observed symptoms, was designed to serve as the criterion for evaluating this approach to teaching. It was used for both the pre-test and post-test. Twenty-six collegiate nursing students were taught the unit on symptomatology as an integral part of a course in beginning medical-surgical nursing in place of

an introductory unit on pathology and nine hours of nursing theory taken by the eighteen students in the control group. Analysis of variance and covariance of the technique were used to test the significance of the differences on the test.

The validity and reliability of the scoring keys and the objectivity and reliability of the scoring of the papers were appraised. Positive *r*'s ranging from .77 to .85 were obtained from the appraisal of the validity of the scoring keys. A comparison of duplicate keys prepared by the investigator yielded a reliability coefficient of .88. The appraisal of the objectivity of the scoring of the test yielded *r*'s ranging from .80 to .93. A comparison of duplicate scoring by the investigator yielded an *r* of .99.

The teaching approach used for the unit on symptomatology was found to have real value for increasing the students' abilities to use a scientific approach to certain nursing problems. The adjusted mean difference between the two Groups on the total post-test was significant beyond the .001 level. The mean gain made by the experimental group was significant beyond the .001 level while that made by the control group was significant at the .02 level. An item analysis of the test revealed that the learning experiences provided in this unit were particularly valuable for helping students (1) make assumptions about the causes of the symptoms observed, (2) decide what nursing care was needed in relation to those symptoms, (3) decide why this care should be given, and (4) decide what changes in the patient's condition would indicate that the nursing care was useful. The adjusted mean differences on the first three of these items was significant well beyond the .001 level, and on the fourth item was significant at the .01 level. The mean gains made by the experimental group on all of these items were significant beyond the .001 level. On the other hand, the control group had an insignificant loss on item one, a mean gain on item two significant at the .02 level, a mean gain on item three significant at the .05 level, and an insignificant mean gain on item four. No significant differences were found between the adjusted means of the two Groups on their other two items included in the test. These measured their abilities to (5) recognize the symptoms manifested by the patients, and (6) give pertinent descriptions of the patient's condition in relation to the symptoms identified. No significant gains were made by either Group on item five, but the mean gain made by the experimental group on item six was significant at the .01 level while that made by the control group was significant only at the .05 level.

These findings demonstrated that the learning experiences provided in the unit on symptomatology enhanced students' abilities to use a scientific approach to nursing problems, and facilitated transfer of learning from physiology to actual clinical nursing problems.

Microfilm \$2.75; Xerox \$9.45. 210 pages.

**THE DEVELOPMENT AND ANALYSIS
OF AN INSTRUMENT DESIGNED TO MEASURE
WORK ATTITUDES, USING SELECTED GROUPS
OF STUDENTS AND EMPLOYEES.**

(L. C. Card No. Mic-1280)

Austin Eugene Gisriel, Ed.D.
University of Maryland, 1959

Supervisor: Dr. Donald Maley

The purpose of this study was to develop an instrument designed to measure general work attitudes of employees. The literature was reviewed in an effort to determine the nature and extent of studies made on the problem of attitude measurement and to find a definition for the term "attitudes." As used in this study, the term "work attitudes" refers to the expressed feelings of the employee toward the capitalistic system, toward the company, toward the job, toward associates, and toward moral responsibilities related to work.

In constructing the original instrument, a list of items that could possibly affect an employee's work attitudes was developed from the five basic parts of the definition of work attitudes. The instrument, which was titled "A Survey of Work Opinions," was pretested on 81 students of the Diversified Occupations classes of three different high schools in Baltimore County, Maryland. By applying the criterion of internal consistency, the number of statements was reduced from 170 in the original instrument to 50 in the final revision. The instrument was then tested on a sample of 103 employees from four companies and one aged people's institution located within the metropolitan area of Baltimore, Maryland.

The reliability of the instrument was found to be consistent with the reliabilities of similar instruments designed to measure various kinds of attitudes. The split-half reliability coefficient for 87 cases of the field test groups was .744, corrected by the Spearman-Brown formula to .853. The reliability coefficient was computed for the pretest groups from scores derived from the fifty items used in the final instrument. The split-half reliability coefficient for the pretest groups totaling 81 cases was .754, corrected by the Spearman-Brown formula to .860.

The method used in validating this instrument was to correlate the scores on "A Survey of Work Opinions" with the immediate supervisors' ratings of employees' work attitudes using the over-all rating scale, Scale A. The statistical hypothesis was that the score on the work opinion survey would not reflect the work attitudes of the employee as those attitudes were appraised by the immediate supervisor using Scale A. The chi-square method was used in testing this hypothesis. The null hypothesis was rejected at the .01 level of probability. An adjusted contingency coefficient of .46 indicated the magnitude of the relationship. No relationship was found to exist between the employees' scores on the work opinion survey and the work attitudes of the employees as measured by the immediate supervisors using the twelve-item scale, Scale B.

The secondary purpose of this study was to make an analysis of the instrument by studying the responses of the field test participants in relation to: (1) some of the general factors that may have affected the employee's

work attitudes, (2) certain specific understandings, knowledge, and feelings that may have affected the employee's work attitudes, and (3) some of the factors that possibly affected the supervisor's appraisals of the employee's work attitudes. Other analyses included comparing the supervisors' ratings and the employees' self-ratings of work attitudes, comparing the ratings of an individual's work attitudes by different supervisors, and examining the comments employees made about work.

A complete evaluation of this instrument would require further and more extensive study with respect to different kinds of employees, supervisors, and employment organizations. Microfilm \$4.10; Xerox \$14.40. 317 pages.

**THE WRITINGS OF SIR HERBERT READ AND
THEIR CURRICULAR IMPLICATIONS--THE
AESTHETIC EDUCATION OF MAN.**

(L. C. Card No. Mic 60-1004)

John Siegfried Keel, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Edward A. Krug

This study interprets the writings of Sir Herbert Read, the British poet and critic, for their meanings as bases for thinking about the problems of education and making curricular decisions. In *Education Through Art* and other works Read has helped clarify some of the major issues of art teaching. But his conceptions take on the proportions of a theory of general education, advocating a pattern of human development based on creative, aesthetic activity in the arts: "The aim of education is the creation of artists--of people efficient in the various modes of expression." Although Read's theory is an attempt to restate ideas from the past, particularly those of Plato, Schiller and the Bauhaus, in terms of modern concepts of art and psychology, it is also the outcome of the philosophy which Read developed in the course of his literary and art criticism.

The idea of "aesthetic education" is based on Read's conception of art as a "dialectical activity," an instinctive, biological function in man by which the contradictions between inner life and the outer environment are reconciled through the creation of aesthetic forms. Art is "the piecemeal recognition and patient fixation of what is significant in human experience. The artistic activity might ... be described as a crystallization, from the amorphous realm of feeling, of forms that are significant or symbolic. On the basis of this activity a 'symbolic discourse' becomes possible, and religion, philosophy and science follow as consequent modes of thought." Viewing art as "an essential factor on which homo sapiens has depended for the development of his highest cognitive faculties," Read concludes that creative activity can serve as the soundest means of the realization of personality, social integration and moral vision. Thus, "art is a way of education; not so much a subject ... as a method of teaching all subjects."

The aesthetic method would utilize the arts--music, dance, poetry, drama, sculpture, painting, etc.--but it would also extend the creative processes to other purposive activities. Formative action in various media at

the level of poetic, creative art should not be limited to the "talented" but should become the integrating principle of the total educative process. Such education involves inducting the individual pupil into media and modes of creative action appropriate to the expressive needs of his unfolding personality. On the basis of his consideration of styles of art in relation to Jungian psychology, Read suggests a theory of types according to which individuals may be understood and helped in discovering their natural mode of perception and in developing an appropriate mode of expression.

Although art, and therefore education, should begin as impulsive play activity, it must gradually be oriented toward a highly disciplined spontaneous activity found among leading creative personalities. Teaching is a matter of evoking expressive activity in the student and assisting him in finding its "organic" form, of providing proper tools, materials and technical guidance, and of gentle assistance according to the best available knowledge of the manifestation of the dynamics of the creative process in the particular individual. Such activity is not a matter of imposing "abstract" or conventional forms on unique experience, it involves the creation of an "objective correlative" according to the promptings from unconscious levels of the mind. Although education may draw freely from accumulative knowledges and traditions, the pupil must "learn" to proceed on the basis of his own developing will-to-form, allowing the full range of his faculties to be brought into play.

Microfilm \$6.15; Xerox \$21.85. 483 pages.

**A CRITICAL ANALYSIS OF EXPERIMENTAL
DOCTORAL RESEARCH IN TEACHING
SECONDARY SCHOOL SOCIAL
STUDIES 1941-1957**

(L. C. Card No. Mic 60-1069)

James Hamilton King, Ed.D.
University of Colorado, 1959

Supervisor: Professor Edwin R. Carr

The purpose of the study was to identify and analyze experimental doctoral dissertations in teaching secondary school social studies which were completed between 1940 and 1958. The analyses are concerned with the hypotheses, designs, mental measures, statistical models, and the conclusions of the theses.

The perusal of bibliographies, abstracts, and other sources led to a reading of seventy-three theses. Thirty-eight of the theses were judged to have met the restrictions of the criterion limiting the scope of the project and are analyzed in the body of the thesis. The analyses are grouped into six chapters dealing with: 1) experimental studies comparing methods of instruction, 2) the effect of curricular organization on learning, 3) the use of various materials designed to facilitate social studies education, 4) the teaching of skills, attitudes, and concepts, 5) measures of levels of achievement, and 6) the teacher of the social studies.

Some conclusions based on the substance of the research are that: 1) the problems approach to the teaching of the social studies can achieve subject-matter objectives

as well or better than traditional methods, and other goals may more readily be attained through its use, 2) the core curriculum can result in the achievement of subject-matter objectives as well or better than so-called traditional forms of curricular organization, 3) the use of motion-picture films and film strips, together with appropriate activities, can improve the teaching of social studies facts and attitudes, 4) the belief that desired skills or attitudes may be taught incidentally while teaching facts is not justified, but the use of planned lessons can achieve such desired goals, and 5) certain teacher characteristics related to teaching success have been identified but no easily used device for rating social studies teachers has been developed.

The research problems faced by those conducting experiments were magnified by: 1) failure to establish good conditions for research in the schools, 2) using unnecessarily complicated experimental designs, 3) using inappropriate statistical models, 4) failure to consider some factors influencing learning, and 5) a tendency, in some cases, to make unwarranted conclusions and generalizations.

Recommendations based on the research which was analyzed are that: 1) the use of the problems approach should be encouraged, 2) the core curriculum should be more widely adopted providing core teachers and materials are available, 3) better films designed to achieve specific social studies objectives should be produced, 4) more teaching should be devoted to the teaching of social studies skills and attitudes, and 5) the selection of teacher candidates should be improved and realistic programs of in-service teacher education should be adopted.

Recommendations for future research in this area are that: 1) more experimental research be done, 2) better experimental conditions be established, 3) better control of factors influencing learning be exerted, and 4) caution in drawing conclusions should be exercised.

Microfilm \$2.70; Xerox \$9.45. 207 pages.

**A COMPARATIVE STUDY OF THE SPEECH
AND AUDITORY CHARACTERISTICS OF
CHILDREN WITH DISCREPANCIES BETWEEN
SPELLING AND READING ACHIEVEMENT**

(L. C. Card No. Mic 60-969)

Inga Borre Kromann, Ph.D.
University of Minnesota, 1959

Problem, Population, and Types of Measures Used

The purpose of the study was to determine what differences, if any, exist between children who achieve below their reading level in spelling and those who achieve above their reading level in spelling. The population consisted of 421 fourth graders from eight randomly selected St. Paul, Minnesota schools. Complete data was obtained for 391 subjects on the comprehension section of the Gates Reading Survey, a 50-word dictated spelling test from the Stanford Achievement Test, and the Lorge-Thorndike Non-Verbal Group Intelligence Test. Nine

individual and small group speech and auditory tests were administered to 158 subjects selected for the sub-group sample.

Groups and Statistical Treatment Involved

Regression equations were used to predict spelling scores from reading scores. An approximate 20 per cent of the boys and of the girls who showed the greatest discrepancy between actual spelling score and spelling score predicted from reading achievement, with actual score being above predicted score, were designated as over-achievers. Similarly, the 20 per cent who showed the greatest discrepancy in the direction of actual spelling score being below the predicted score, were considered underachievers. Reading ability was controlled by selecting an equal number of discrepancy cases from the upper, middle, and lower thirds of scores on the reading test.

Considering boys and girls separately, spelling over-achievers and underachievers were compared on nine speech and auditory measures. Sex comparisons were made for overachievers and underachievers on each measure. Homogeneity of variance among the four comparison groups was tested with the L_1 Test. Where the one-way analysis of variance showed significant differences among mean scores, Duncan's Multiple Range Test was used to identify the groups for which significant differences existed. The F-Test and the appropriate Behrens-Fisher or T-Test were used to check variances and means in cases where the L_1 Test indicated lack of homogeneity.

Findings

The null hypothesis of no significant differences among means of overachievers, underachievers, boys and girls, was rejected for five measures. Testing at the .01 level of probability, overachieving and underachieving boys were found to be significantly different in giving letter for sound, giving words beginning with given sound, and giving words ending with a given sound. Overachieving and underachieving girls were significantly different in giving words beginning with given sound, and in memory for oral spelling. Overachievers, boys and girls, differed significantly in memory for oral spelling.

Differences significant at the .05 level of probability were found between overachieving and underachieving girls in giving words ending with given sound; between overachieving and underachieving boys in blending letter sounds and memory for oral spelling; and between underachievers, boys and girls, in giving letter for sound and in memory for oral spelling.

There were no significant differences in intelligence among the four groups.

Conclusions

The following conclusions were made within the limitations of the study:

1. Some auditory abilities are associated with discrepancies between spelling and reading achievement. In the present research, this was true more often for boys than for girls.
2. Where significant differences existed, pupils who were more successful in spelling than in reading

were superior in auditory abilities to those who were less successful in spelling than in reading.

3. While results of this study indicate that differences between reading and spelling ability are not limited to auditory or articulative capacities, results do justify the recommendation that auditory abilities be carefully appraised as part of the diagnostic procedure.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

THE NATURE OF PROBLEM SOLVING AND ITS APPLICATION TO CORE CURRICULUM

(L. C. Card No. Mic 60-1282)

Ruth Ina Mills, Ed.D.
University of Maryland, 1959

Supervisor: Dr. Kenneth Hovet

Purpose:

The purpose of this study was to determine (1) the contributions of learning theorists and other psychologically oriented persons to an understanding of problem solving, (2) the contributions of curriculum writers to an understanding of problem solving in core curriculum, and (3) the extent to which pupils in core curriculum classes engage in problem-solving behaviors (as problem solving is delineated in this study).

Procedures:

The writings of prominent learning theorists were surveyed and aspects of their theories which seemed to concern problem solving were related. Summaries of the theorists' stated or suggested positions on problem solving were made. From the collected summaries eleven conditions which presumably influence or affect problem solving were derived. They were:

1. In a problematic situation the person's response involves a certain amount of risk.
2. A problematic situation has a beginning.
3. A problematic situation has an end.
4. When a problem is once solved, an identical situation can be met without recourse to problem solving.
5. Past experiences influence problem solving.
6. Generalizations occur during problem solving.
7. Hypothesis behavior usually occurs.
8. The environment bears a direct relation to problem solving.
9. A certain amount of random behavior is evident during the time of solution.
10. Problems involve different degrees of complexity.
11. The condition of the individual determines how well he can solve problems.

The writings of other psychologically oriented persons were surveyed particularly to determine steps which occur during problem solving. A classification of steps was adapted. The steps were:

1. The pupils realize that a difficulty exists.
2. The pupils state the problem.
3. The pupils solve the problem.
4. The pupils determine whether the original difficulty has been cleared up.

The interpretations of curriculum writers about problem solving in core curriculum were studied.

Two survey instruments, a teacher questionnaire and a questionnaire for pupils, were devised to determine the extent of problem-solving practices in core curriculum classes.

The respondents to the teacher questionnaire were asked to state the units which they use or recommend and the type of core to which they subscribe. The respondents were also asked to check those behaviors, on a checklist of 266 behaviors, which they believe occur when pupils solve problems in core curriculum classes. The behaviors were classified according to (1) the predetermined steps in problem solving and (2) behaviors which may occur during any step in problem solving. The 266 behaviors were adapted from the related readings. The teacher questionnaire was submitted to a national sample of persons who are interested in core curriculum. The replies of present and former core teachers were used to determine the occurrence of problem solving in core curriculum classes.

The questionnaire for pupils contained sixty-five items adapted from the teacher questionnaire. Four items supposedly corresponded to the types of core, fifteen represented behaviors which occur during the four steps in problem solving, and the others were behaviors which presumably occur during any step in problem solving. Pupils listed units which they have enjoyed. The questionnaire for pupils was submitted to pupils in selected classes.

The responses to the questionnaires were interpreted in relation to the conditions which presumably influence or affect problem solving.

Findings:

The evidence seemed to indicate (1) that no unit can be considered a problem, per se, but that units provide content through which a series of problems may be solved; (2) that types of core are equivalent to particular methods through which problem-solving behaviors may occur if certain conditions are provided; and (3) that while problem-solving behaviors seem to occur to some extent in core curriculum classes, few behaviors can be considered problem-solving behaviors that occur in problematic situations. Microfilm \$4.80; Xerox \$16.90. 373 pages.

A PHILOSOPHICAL STUDY TO PROPOSE OBJECTIVES FOR EDUCATION IN PUERTO RICO

(L. C. Card No. Mic 60-1124)

Domingo Rosado, Ed.D.
New York University, 1959

The purpose of this study is to examine Puerto Rican education in the light of the transformation that has taken place in the island in the last decade as a result of Operation Bootstrap, to determine:

- (a) if present-day objectives for education need reexamination, redefinition or change
- (b) and, as warranted by findings, to propose objectives for education in Puerto Rico

The study was conducted through (a) interviews with leaders at the national and local levels, (b) personal observation of how people live and work in communities previously studied by Steward's research associates in 1948, and (c) by means of a questionnaire on educational issues and beliefs.

The questionnaire was distributed among 375 persons out of which 296 returned it entirely completed.

Respondents were chosen from the following five groups: (a) general supervisors of the Department of Education, (b) local supervisory officials (superintendents of schools, assistant superintendents and school principals), (c) college of education professors, (d) teachers (all levels), and (e) lay people.

An analysis of the evolution of the Puerto Rican culture as a result of the Spanish, Indian and African influence was made. This showed that the Puerto Rican culture, however, similar to the culture of Spain in its fundamental aspects, was different from that of the Motherland in many respects. It was a brand of Spanish culture with many local or regional characteristics of its own.

Besides the analysis mentioned above, a study of the influence or impact of the American culture on the Puerto Rican culture from 1898 to the present shows the encroachments the former has made on the latter. The Puerto Rican culture, agrarian at the beginning of this century, is in the process of changing to an industrial culture. A revolution has occurred from 1940 to the present.

The inquiry conducted, as stated above, shows that education is not geared to the culture in many respects. It also shows that there are four main value-directions in Puerto Rican society. These are: (a) toward respect for freedom, (b) toward love for a more democratic living, (c) toward respect for human rights, and (6) toward a fuller and happier living.

Inasmuch as education should be geared to and should further the value-goals of society, the writer concludes that objectives for education in Puerto Rico need redefinition and change. In order to gear education to the Puerto Rican culture, the author suggests the following objectives for education in the island: (a) knowledge and skills, (b) intelligent habits of thinking and problem-solving, (c) health, (d) education for a vocation, (e) intelligent use of leisure time, and (f) intelligent human relations.

For final adoption and promulgation of these objectives, the writer suggests a series of seminars to be held at the district, country and national levels. Participation of

educators and lay people should be secured. The final statement of objectives should, once adopted and promulgated by the Department of Education, be the objectives of education for all public schools in Puerto Rico.

Microfilm \$4.15; Xerox \$14.65. 321 pages.

**A STUDY OF THE ASPECTS OF
DIFFERENTIATION OF ABILITIES IN
INTERPRETATION OF READING WITH A
GROUP OF GIFTED CHILDREN**

(L. C. Card No. Mic 60-903)

Robert George Trauba, Ed.D.
University of Kansas, 1959

This study was conducted in order to explore why some gifted children perform so much better than other gifted children in interpretative reading. A selected group of children with high intelligence quotients and high reading ability were studied in an attempt to find out if there are common characteristics and differences among the children who perform at the highest level in interpretative reading and those who perform at a relatively lower level.

Procedure

1. Seventy-one gifted fourth grade children from three elementary schools in Northeast Kansas were selected to take part in the study. For this study, gifted children were defined as those who had an intelligence score of 120 and above, as measured by the Kuhlman-Finch Intelligence Test IV; were reading at a level one year or more beyond their grade placement as measured by the Iowa Every-Pupil Test of Basic Skills; and were recommended by their classroom teachers and school principals as being children with unusually high general ability.

2. Selected passages in the McCall-Crabbs Standard Test Lessons in Reading, the instrument used for determining ability in reading interpretation, were administered to all the gifted pupils. The children were divided into three groups on the basis of their performance on these passages. The upper group consisted of the 15 children performing at or near the very top on these tests; the lower group, the 15 children performing at a relatively lower level. For this study, only the upper and lower groups were considered for further study.

3. The two groups were then administered the Kuhlman-Finch Intelligence Test to verify the test scores that appeared on school records, and these scores were later used in the statistical comparisons of the groups. The vocabulary subtest of the Weschler Intelligence Scale for Children was administered to determine the vocabulary level of the children. The Durrell-Sullivan Reading Capacity and Reading Achievement Test was administered to provide a standardized measure of capacity and achievement in reading. The Iowa Every-Pupil Test of Basic Skills was administered to provide a standardized measure of the pupil's general scholastic achievement.

4. Teachers and principals were interviewed for additional information about the children.

5. A conference with the parents in their homes was conducted by the writer to investigate the physical, social, and environmental backgrounds of the children.

Conclusions

The statistical techniques and case-study interviews used in the collection of the evidence have certain obvious limitations.

Standardized Test Results

A wide range exists among gifted children in reading interpretation ability.

Significantly higher scores were made by the upper group in intelligence tests, vocabulary development, reading capacity and achievement, and general scholastic achievement in (a) reading comprehension, (b) reading vocabulary, (c) use of references, (d) use of dictionary, (e) map reading, (f) correct usage, (g) fundamental arithmetic knowledge, and (h) arithmetic problems.

Case Studies

The personality traits which seemed to be characteristic of the children in the upper reading-interpretation group include: (a) good memory, (b) preference for detail work, (c) bookishness, (d) procrastination, (e) optimism, and (f) excitability. Traits characteristic of the children in the lower reading interpretation group include: (a) being a good follower, (b) being affectionate, and (c) ease of disciplining.

The children in the upper group matured more rapidly in walking, creeping, and speaking, were more active in children's organizations and viewed television two and one-half hours less per week than the lower group.

The children in the upper group had more definite vocational plans, were more interested in creative and scientific activities, and indicated reading as the favorite pastime. All were active members of the library and the parents of the upper-group children read more books and magazines than parents of the lower group children.

Microfilm \$3.55; Xerox \$12.60. 276 pages.

**A COMPARISON OF THE EFFECTIVENESS
OF TWO METHODS OF TEACHING GENERAL
MUSIC IN THE JUNIOR HIGH SCHOOL**

(L. C. Card No. Mic 60-904)

James Joseph Weigand, Ph.D.
University of Kansas, 1959

Statement Of The Problem

The purpose of this study was to show that what appears to be more or less ineffective teaching in the general music class is often caused by poor organization and presentation of materials, and could be improved by the judicious organization of activities and materials into broad units of instruction for student experiences during the one-semester general music class in the seventh grade.

Procedure

The study of effective teaching in junior high school general music classes was conducted during 1957-58 in six Kansas junior high schools. Three schools were

designated as experimental schools and three as control schools. Experimental schools were given carefully constructed resource units and materials. Control schools were given unorganized subject matter and permission to teach the classes in any manner desired. Selection of the subject matter was based on examination of published resource units, workbooks, music books, school curricula, state courses of study, theses on general music, curriculum reports, and music education philosophy. Testing instruments used were: The Gaston Test of Musicality,¹ Music Notation Test,² and an achievement test constructed for the study. These were given both before and after the experimental teaching period. Material given to experimental schools consisted of five resource units: Instruments of the Orchestra, The Marriage of Figaro, Folk Music of the Appalachian Mountains, Cowboy Music, and Edvard Grieg. Control schools received a suggested topic sheet with materials listed on the same subjects.

In order to determine whether there were significant results, three statistical procedures were used in the testing program: A test for homogeneity of variance, a test for the significance of difference between the pretest and posttest means for experimental and control groups, and a test for the significance of difference between means between the experimental and control groups.

Conclusions and Recommendations

1. From the results obtained it appears that effective teaching may take place whether or not the materials are organized into resource units. However, since two of the three experimental classes showed a significantly higher degree of learning when tested after being taught from resource unit material, it can be concluded that the resource unit method of instruction produces a higher degree of effective teaching and learning.

2. Teachers of general music in most junior high schools have additional music teaching duties which do

not allow time for adequate preparation of material and activities. Effective teaching requires time for class preparation.

3. From teacher comments and from investigative reading it would appear that music teachers should make an effort to gain a more adequate understanding of adolescent behavior.

4. There is a need for more experimental study on the effective use of music education resource units.

5. Results seem to indicate that seventh grade adolescent pupils are not familiar with testing procedures, leading to the belief that the majority of music teachers are not familiar with the methods and materials of a music testing program.

6. Music teachers and school administrators should give more time to selection of materials necessary for effective teaching.

7. Current textbooks, workbooks, and song books recommended for general music are closely in agreement on teaching materials.

8. From the results of this study it seems that teachers using a wide variety of organized material and equipment have a better opportunity to engage in effective teaching.

9. It is recommended that further experimental research be done on general music classes using teacher-constructed resource units.

10. It is further recommended that teacher training institutions prepare music education majors in the philosophy of the general music class as outlined in this study and in the recommendations of the Music Educators National Conference.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

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2. Stephen E. Farnum. Music Notation Test. The Psychological Corporation, New York, 1953.

ENGINEERING

ENGINEERING, AERONAUTICAL

SUPERSONIC SPEED FLUTTER ANALYSIS OF CIRCULAR PANELS WITH EDGES ELASTICALLY RESTRAINED AGAINST ROTATION

(L. C. Card No. Mic 60-942)

Jasti Venkata Rattayya, Ph.D.
University of Minnesota, 1959

The flutter problem of flat circular panels with edges elastically restrained against rotation has been formulated in terms of small-deflection plate theory. The panel is subjected to isotropic tension or compression in its middle plane in addition to the supersonic compressible flow passing over its upper surface (still air below). Linear

piston theory is employed to predict the aerodynamic load on the vibrating panel.

The problem is investigated by a Rayleigh type analysis involving chosen modes of the panel as degrees of freedom. The assumed modes correspond a) to the vibrational mode shapes of the panel in vacuo or b) to static deflection shapes of the panel with uniform and linearly varying load over the panel. The results obtained by these two methods for the two-mode analysis of the clamped and simply supported edge cases have compared very well. This supports the use of static deflection shapes in flutter analyses. The static deflection shapes have then been employed to investigate the variation of the stability parameter and the minimum panel thickness required to prevent flutter for various degrees of edge fixity.

Higher-term approximation has been employed to investigate the convergence of the flutter solution. For this

purpose the flutter mode shape of the clamped edge panel has been expressed in series form in powers of $r \cos \theta$. The results of three-, four- and five-term approximations have displayed oscillatory behaviour with apparently rapid convergence of the solution.

The two-mode analysis employing vibrational mode shapes has yielded conservative results in comparison with other analyses. Investigation of the effects of aerodynamic damping, structural damping and mid-plane load are also included in this study.

Microfilm \$2.50; Xerox \$5.80. 118 pages.

ENGINEERING, CHEMICAL

HEAT TRANSFER BY DROPWISE CONDENSATION OF STEAM ON HORIZONTAL TUBES

(L. C. Card No. Mic 60-1277)

Louis Peter Costas, Ph.D.
University of Maryland, 1959

Supervisor: Dr. Donald T. Bonney

Heat transfer by dropwise condensation was studied on horizontal tubes for the system of essentially stationary steam at one atmosphere pressure. The condensation occurred on the tubes' outer surfaces and cooling water flowed within the tubes. The greatest majority of tests were conducted on highly polished copper and chromium surfaces, although brass also was used in dropwise condensation and nickel for the film type condensation experiments. Promoters utilized were oleic and stearic acids and in all cases, two foot lengths of 5/8 inch, 16 BWG size condenser tubing was exposed to the steam.

The study was developed in three principal stages, briefly described below.

The first used a stationary copper tube in which six thermocouples were imbedded in the tube wall to measure the surface temperatures on the top, side, and bottom of the inlet and outlet ends of the tube. The steam side coefficients on these early runs were surprisingly low, 1,800 Btu/hr ft² °F, and showed no trend with the heat flux. Later runs on a rotating copper tube yielded some steam side coefficients of over 5,000. No proven explanation for this difference could be found, although it most likely is closely related to the cuprous oxide film which forms.

In the second stage, a single chromium plated copper tube was employed. The method of experimentation was essentially the same with the exception that the tube could be rotated and contained only three thermocouples, one at the inlet, middle, and exit ends. With this arrangement the temperatures were measured every 30° around half the circumference. The results of this stage showed marked improvement in the steam side coefficients over those of the early copper runs. At the lowest heat load of 25,000 Btu/hr ft² the coefficient was 6,000 Btu/hr ft² °F, and at the maximum load of 100,000 it was somewhat more than 10,000 Btu/hr ft² °F. There was some evidence that the steam side coefficient was approaching a maximum at the 100,000 Btu/hr ft² load, but this cannot be stated with absolute certainty.

The third stage was divided into two subdivisions. In both cases the same tube used in the single chromium tube runs was placed three inches below another chromium plated tube. In the first case the water entered the lower tube and was then brought back in series thru the upper one. This run was therefore a double pass type. In the other runs parallel flow was employed, water entering each tube at the same end under identical flow rates. The steam side coefficients for these runs were distinctly lower than those with the single chromium tube. Both series and parallel runs indicated coefficients of about 5,000 Btu/hr ft² °F at a load of 25,000 Btu/hr ft², whereas at 100,000 Btu/hr ft² the series coefficient was somewhat higher than that of the parallel, 6,500 to 5,600 Btu/hr ft² °F. The maximum steam side coefficient for both types of runs was identical, 6,900 Btu/hr ft² °F, and this came at a load of 57,000 Btu/hr ft² for the parallel and 70,000 for the series.

A few runs were made with film condensation on a nickel plated tube to contrast the difference between the film and dropwise mechanisms. The results obtained are in fairly good agreement with the other experiments using similar apparatus. At a heat load of 25,000 Btu/hr ft² the steam side coefficient was 3,200 Btu/hr ft² °F but fell to 1,550 at a load of 65,000 Btu/hr ft².

The steam velocity plays a very important role in determining the magnitude of the coefficient, and on all runs it was kept as close to zero as possible in order to obtain the minimum values of the steam side coefficient.

Temperature profile curves around the circumference show that the hottest point is at 90° from the top on the single chromium tube runs, but the coldest in the parallel and series type for the lower tube. On the film condensation experiments the maximum temperature is at the top and the minimum is at the bottom of the tube, exactly as theory predicts and previous work has shown.

The present work has extended to horizontal tubes what has been shown for vertical ones: dropwise is superior to film condensation, particularly at higher heat loads. Increases in the over-all heat transfer coefficient of twenty per cent and more can be realized under conditions which are encountered in practice. The consideration of dropwise condensation in commercial systems where good steam is available appears to be warranted.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

THE HYDROGEN REDUCTION OF FERRIC OXIDE POWDER IN A TUBULAR REACTOR

(L. C. Card No. Mic 60-965)

Ivo Giovanni Dalla Lana, Ph.D.
University of Minnesota, 1958

Adviser: Neal R. Amundson

The chemical reduction of a ferric oxide powder with hydrogen was performed in a tubular flow reactor. The gas and the powder were contacted by entraining the particles and passing the mixture up a vertical reactor. The reactor was made from nominal two-inch stainless steel pipe, 24 feet long, of which length, 16.1 feet comprised the reaction zone.

The attendant problem of particle residence times was considered for the cases of parabolic and plug flow velocity profiles assuming no radial transport of particles. The effect upon an average residence time resulting from a distribution of particle diameters was also considered. Equations were developed for predicting a mean mass-weighted powder residence time for the two extremes in velocity profiles. For viscous flow, the equation allowed for settling effects without recirculation and also provided a basis for predicting the size distribution of the powder emerging from the tubular reactor.

An Fe_2O_3 powder was prepared in which particle sizes ranged from 2 to 22 microns. In the experimental kinetic studies, this powder was reduced at temperatures of 450°, 500°, 550° and 600°C for mean residence times from 2 to 12 seconds and a pressure of approximately 1250 mm.Hg. Some reduction was also carried out at 550° and 1010 mm.Hg.

The feed and product powders from the 550°, 1250 mm.Hg. tests were subjected to centrifugal sedimentation particle-size determinations and ethane adsorption surface-area measurements. The importance of the physical characteristics of the powder has been stressed. Using the kinetic data and observations on the physical characteristics of the powder, a reduction mechanism was proposed. With the aid of this mechanism, it was possible to explain the sequence of phenomena associated with the reduction.

Microfilm \$2.50; Xerox \$6.80. 144 pages.

TWO PHASE CRITICAL FLOW OF STEAM-WATER MIXTURES

(L. C. Card No. Mic 60-855)

Duane William Faletti, Ph.D.
University of Washington, 1959

Chairman: R. W. Moulton

The critical flow of steam-water mixtures was studied in concentric annuli having center rods of 0.188 and 0.375 inch O.D. Care was taken to support these rods, which ran the entire length of the 0.574 inch I.D. test section and extended beyond the throat (exit plane), in such a manner that flow disturbances were minimized. Critical throat pressures ranged from 26 to 106 psia and qualities (weight per cent steam) ranged from 0.1 to 97.5 per cent.

Pressure taps on the walls of the test section and on the center rods (one of which could be moved axially) permitted a detailed study of the pressure profiles both upstream and downstream of the throat. These profiles were characterized by rapidly increasing pressure gradients near the throat and by overexpansions typical of jets expanding into a receiver at subcritical pressure. The heights of the standing waves resulting from these overexpansions decreased with decreasing quality becoming less than the experimental accuracy at five per cent steam. Another characteristic of the flow was the sensitivity of the throat pressure to back (receiver) pressures smaller than the critical throat pressure. This effect, which occurred at qualities less than 50 per cent, along with the previous mentioned disappearance of the standing

wave, suggests the possibility that the critical flow of steam-water mixtures may not be a true sonic choking.

The critical mass velocities were correlated by plotting the ratio of the observed mass velocity to the mass velocity calculated from the homogeneous flow model versus per cent steam. No pressure dependence was noted with the exception of the quality region between two and fifteen per cent where, at most, a twelve per cent change in G_0/G_{TH} was found. Below qualities of one per cent, the correlation is of limited value because of its greatly increased sensitivity to quality.

Neither the method used to mix the steam and water, or the amount of preheating given the entering water had any effect of the correlating ratio. Only data from the shortest test section, having a length of 0.53 inches, exhibited any effect of length. Data taken with this test section suffered a reduction in the correlating ratio for all but the highest qualities.

Since substitution of a 0.188 inch center rod for a 0.375 inch center rod did not affect the correlation, it appears that this correlation is applicable to full bore pipes near one half inch diameter and furthermore, that critical mass velocities in full bore pipes may not be a strong function of diameter.

An equation was derived which gives accurate values of the theoretical mass velocity as a function of quality and pressure. By combining this with an equation fitted to the correlating curve, a useful relation was obtained giving the predicted critical mass velocity as a function of critical pressure and quality for qualities ranging from 25 to 95 per cent.

When the surface tension of the two phase mixture was lowered by adding small amounts of a commercial detergent to the entering water, a significant rise of the critical pressure was observed below qualities of 30 per cent. Though no changes in the critical flow rates were observed, the increases in the critical pressures were large enough to decrease the correlating ratio by 10 and 5 per cent at 0.1 and 30.0 per cent steam, respectively.

The sensitivity of the flow rate to increases in the back pressure from subcritical values to values much greater than the critical was studied and found to be quite small. This indicates that, though design methods based on analytical models, such as the homogeneous model, may be in error as to the correct value of the critical pressure, they may give sufficiently accurate values of the critical flow rate for design purposes.

Microfilm \$2.80; Xerox \$9.70. 214 pages.

THE MISCIBLE DISPLACEMENT OF OIL AND WATER FROM POROUS MEDIA BY VARIOUS ALCOHOLS

(L. C. Card No. Mic 59-6776)

Carl Gatlin, Ph.D.
The Pennsylvania State University, 1959

The domestic oil industry of the United States is faced with the problem of locating new oil reserves. Two factors which make this task increasingly difficult are the ever rising cost of exploratory drilling, and the diminishing number of undiscovered commercial oil fields existing in this country.

On the average about one-third of the oil content of known and developed reservoirs is economically recoverable by conventional secondary recovery methods. Hence an alternate means of increasing the oil reserve is to find more efficient exploitation techniques. Within the last ten years considerable progress has been made in developing miscible phase displacement techniques, whereby complete oil recovery is obtained from the contacted portion of the oil reservoir.

This study defines the basic mechanism of the miscible displacement of oil and water from porous media by various water driven alcohol slugs. Three distinct alcohol slug processes were studied. A calculation method is also developed which enables the production behavior of linear systems, subjected to these processes, to be predicted. Considerable data concerning the quantity of alcohol required for oil recovery were also obtained.

All data were obtained in a one inch diameter, 100 ft long unconsolidated core. The porosity of this system was 35 per cent and the permeability was approximately 4 darcys. Total core pore volume was 5716 cc. All displacements were conducted at a constant injection rate of 5 to 6 cc/min, which corresponded to a frontal advance of 5 to 6 ft/hr.

The first portion of this investigation is concerned with the use of a single alcohol (isopropyl) as the slug material. This alcohol (IPA) is completely miscible with both oil and water, however, miscibility of the three component system, oil-water-IPA, requires a relatively high concentration of IPA. Hence the displacement is not of the miscible type unless the IPA concentration is maintained above some critical value.

In later studies two distinct process variations were developed. The first of these utilized methyl alcohol (MA) and IPA as slug materials. It is shown that methyl alcohol may be substituted for IPA at the front and rear of the slug with no loss of oil recovery. Since MA is considerably cheaper than IPA, this represents an important step toward economic application.

A second process variation used normal butyl alcohol (nBA) and MA as the composite slug. The nBA segment is injected first. This technique offers several technical advantages. The high cost of nBA, however, precludes the commercial application. It is possible that this basic process, subject to changes of alcohol type, may lead to a commercial process.

Microfilm \$2.50; Xerox \$8.60. 188 pages.

THE EFFECT OF PRESSURE ON ORBITAL ELECTRON CAPTURE

(L. C. Card No. Mic 60-1233)

William Barney Gogarty, Ph.D.
University of Utah, 1960

Chairman: E. Bert Christiansen

The purpose of this investigation was to study the effect of pressure on orbital electron capture. The theory of electron capture, as presented, establishes the functional relationship between the total decay constant and the electron densities at the nucleus for the various sub-

shells. With the aid of this theory and the consideration of other factors beryllium (7) and barium (131) were selected as the isotopes which, with pressure, might be found to experience the greatest change in decay constant. The properties considered in making this selection were those of atomic number, degree of compressibility, and possession of energy available for decay.

During this investigation three types of cell design were developed in which the properties of high coefficient of friction and of the high shearing stress of catlinite (pipestone) were utilized. Radioactive samples in one type of cell design were pressurized to 156,000 atm. for six days, while another type of cell design was used to obtain average pressures of 100,000 atm. for more than forty days. Anvils made of cemented tungsten carbide and externally supported with hardened steel rings were used to transmit the total thrust from the hydraulic press to the pressure cell containing the active sample. The design of this multi-ring anvil pressure apparatus was evolved through the use of equations developed from the basic equations of Lamé and Clapeyron for thick-walled cylinders. Total thrusts to these anvil assemblies were supplied by a commercial 50-ton hydraulic press and two 100-ton hydraulic presses. The 100-ton presses were designed and built especially for this investigation.

An investigation of the irreversible compressibility of silica glass was undertaken to determine if this property of glass could be used to establish the force distribution across the pressure cells. Results of this research verify the theoretically predicted distribution of forces over a solid disk between two anvils. The data from the investigation of this property of the glass were correlated to yield a function between the percentage change in density and the pressure. This function extends to a pressure of 200,000 atm., at which pressure the percentage change in density is 13.2. Two of the three cell designs utilized lead and silver chloride to incase the radioactive samples in order to increase the likelihood of obtaining hydrostatic pressure. Glass disks inserted in the place of the radioactive samples in these cells experienced an approximate uniform percentage change in density.

Radioactive counting for this investigation was performed with Baird Atomic's single channel differential scintillation spectrometer, Model 516. Selection of this counting system was based on a comparison of the type of radiation necessary to be detected and the characteristics of the systems available for detecting these radiations. A counting technique for accurately determining small differences in the decay constant of two samples was developed for use with this scintillation system.

Results of this investigation indicate that pressures of a sufficiently great magnitude were used to increase the decay constant of the two isotopes studied. A least-squares fit, based on a linear relationship between the fractional change in the total decay constant and the pressure, was made for all runs obtained with a particular type of pressure cell. The increase in fractional change per atmosphere from these relationships is 2.5×10^{-8} and 1.3×10^{-8} for the two cells in which beryllium (7) was pressurized, and is 0.66×10^{-8} for the third type of cell in which barium (131) was pressurized. Theoretical calculations of the changes in decay constants expected with the pressures used were not attempted because the small changes observed would probably be within the

errors of the quantum-mechanical calculation. Since six out of a total of twenty-four runs showed a decrease in the decay constant outside of the statistical error, reasons for errors causing these values, which are theoretically impossible, are taken into consideration.

Microfilm \$3.00; Xerox \$10.35. 230 pages.

**LIQUID-VAPOR PHASE BEHAVIOR IN THE
CRITICAL REGION IN SYSTEMS WHICH FORM
AZEOTROPES: THE BINARY SYSTEMS
PERFLUORO-n-HEPTANE WITH n-ALKANES.**

(L. C. Card No. Mic 60-1188)

Lawrence William Jordan, Jr., Ph.D.
The Ohio State University, 1959

The critical behavior of mixtures of perfluoro-n-heptane with the normal alkanes from ethane to nonane was studied. Minimum critical temperatures in the critical locus curves, indicating the formation of positive azeotropes, were found for the systems from butane through octane. The propane system showed a temperature plateau between the critical temperatures of the pure components. The ethane and nonane systems exhibited the normal maximum-pressure type of critical locus curves without maxima or minima in temperature.

Comparison of the experimental data with the results predicted by the conformal solution theory yields a qualitative agreement only for the case where the nonideality is attributed to a non-balance of the non-central forces. No agreement between theory and experiment is indicated for the cases where the molecules are assumed spherical or where the nonideality is attributed to a non-balance of the central forces.

A qualitative explanation is offered for the behavior of these systems. This explanation is based on the rigidity, size, inertness, and packing effects of the perfluoro-n-heptane molecule. A possible relation to the critical behavior of other types of azeotropic systems is proposed.

Microfilm \$2.55; Xerox \$8.80. 195 pages.

**MEASUREMENT OF CONCENTRATION
FLUCTUATIONS IN A BAFFLED,
STIRRED VESSEL.**

(L. C. Card No. Mic 60-1239)

Francis Scott Manning, Ph.D.
Princeton University, 1959

In this thesis a steady state stirred system, produced by continuously feeding water and sodium chloride solution tracer and removing the overflowing exhaust, is investigated microscopically by measuring point concentrations with a specially designed conductivity probe. By means of suitable electronic equipment, the following statistical parameters, applicable to volume elements of the order to 0.1 mm^3 - time-average mean concentration, total r.m.s. concentration fluctuation, spectral distribution function and Lagrangian microscale - are measured for

1, 2, and 4 inch flat-bladed turbine impellers at rotational speeds of 284 to 2860 r.p.m. Average liquid velocities are also estimated with a pitot tube.

Time-average mean concentration values remain constant throughout the stirred vessel, while decay rates of concentration fluctuations approximate a modified form of Corrsin's predictions for an idealized isotropic turbulent mixer. Dependency of spectral distribution functions on frequency varies from Kolmogoroff's negative five-thirds power at frequencies of 20 c.p.s. to Heisenberg's negative seventh power at frequencies of 2000 c.p.s. Lagrangian microscales remain essentially constant in all regions of the mixing vessel except at positions within 0.5 inch of the impeller, where they decrease with proximity to the impeller. Average velocities in the vertical center of the horizontal two-dimensional fluid sheet produced by flat-bladed turbines vary inversely as the separation distance from the center of the vessel.

This method promises to be a refinement in the approach toward characterizing stirred vessels, as concentration fluctuations produced under different mixing conditions can be compared. This comparison may be used as a criterion for judging the efficiency of impellers of widely varying geometrical design. It should be noted that while the smallest volume element capable of being detected is very small compared to the tank dimensions, it is still very large compared to the Kolmogoroff scale of turbulence. Hence only comparatively gross turbulence characteristics are measurable.

Microfilm \$3.70; Xerox \$12.85. 285 pages.

FACTORS AFFECTING FLUIDIZED BED QUALITY

(L. C. Card No. Mic 60-871)

Jacob Benjamin Romero, Ph.D.
University of Washington, 1959

Some factors affecting fluidized bed quality have been investigated. A bed quality index, which is closely related to previous definitions, is developed entirely from exit bubble magnitude and frequency measurements. These were obtained by recording the influence of flow fluctuations on a hot wire anemometer.

Experiments were conducted by compressed air fluidization in a four inch glass column housed in a pressure vessel. Tapered beds, beds with internal screens, and inlet and support grid design variations were investigated. The seven materials fluidized including two sizes of glass beads, two sizes of sand, crushed olivine rock, iron oxide catalyst and lead shot were selected to give beds of normally low quality and high gas flow rates. Particle sizes ranged from 0.0118 inches for iron oxide to 0.046 inches for lead shot, and specific gravities from 2.46 for glass beads to 11.08 for lead shot. Bed heights ranged from 6.5 to 30.5 inches. Flowrate ranged from zero to a flowrate exceeding the slugging point for each material.

The gross data on fluidization were in quantitative agreement with previous work for both high pressure and atmospheric pressure. The bubbling frequency was found to decrease slightly with flowrate after a maximum was reached, to decrease with bed height, and also to decrease somewhat with particle size.

A criterion for aggregative or particulate fluidization was proposed which is based on groups pertinent to bed stability. The pertinent groups were a Froude number, Reynolds' number, a density ratio, and a length ratio. Successful correlations of bubble sizes and frequencies suggested by the treatment on the fluidization criterion have also been made. Available bubble size and bubble frequency data were correlated with standard deviations of ± 13 per cent and ± 4 per cent respectively, on the basis of a Froude-Reynolds' product. Pressure variations used in this work did not noticeably change the bed dynamics.

The use of a tapered bed had little effect on the fluidization quality at most flowrates, but at a flowrate just above minimum good suspension of the solid occurred. At this flowrate, however, most of the bed mixing was sacrificed. The use of internal annular screen grids has a pronounced effect on the fluidization quality, and permitted the operation of beds of high height to diameter ratio without slugging or large bubbling.

It is believed that the experiments performed provide valuable insight into the dynamics of fluidization. The correlations and design techniques should prove useful in correlating such data and in future fluidized bed designs.

Microfilm \$2.50; Xerox \$8.60. 190 pages.

EVAPORATION RATES OF LIQUIDS TO FLOWING GAS STREAMS FOR CONDITIONS OF HIGH CONCENTRATION GRADIENTS

(L. C. Card No. Mic 60-973)

Donald E. Severson, Ph.D.
University of Minnesota, 1958

The influence of high concentration gradients and high evaporative velocities on rates of mass transfer was studied by evaporating liquids into low speed inert gas streams at pressures approaching the vapor pressure of the liquids.

Inert gas concentration in some experiments changed nearly five-fold across the boundary layer. The velocity normal to the surface (due to evaporation), usually neglected in comparison with main stream velocity, varied from 0.0006 to 10.3 times the main stream velocity.

The data for air-water, air-carbon tetrachloride, air-chlorobenzene and helium-chlorobenzene systems were represented within experimental error over the Graetz number range of 0.1 to 1800 by the "flat duct" equations of Butler and Plewes and also by the usual dimensionless plots.

Microfilm \$2.50; Xerox \$5.00. 100 pages.

SOME PHYSICO-CHEMICAL PROPERTIES OF THE HUMIC ACIDS

(L. C. Card No. Mic 60-976)

Herbert C. Walther, Jr., Ph.D.
University of Minnesota, 1959

Presented herein is a broad, preliminary survey of several physico-chemical properties of a sample of humic acids extracted from Minnesota peat. The data presented can serve as a basis for further, more intensive studies of specific characteristics and of samples of particular interest. The results observed should be of assistance in selecting techniques to be used. The properties investigated herein may also be useful in following the effects of chemical reactions, fractionations, or other physical processing on the humic substances. In view of the present state of knowledge of the humic acids no attempt was made to concentrate on a particular property nor to work with a highly, but arbitrarily, fractionated sample.

Viscosity measurements of solutions of crude humic acids extracted from Rice Lake peat with 0.25 N sodium hydroxide give evidence that the humic acid molecules are nonspherical, and probably hydrated polyelectrolytes. Sedimentation measurements with an ultracentrifuge equipped with a Schlieren optical system indicate that the humic acids are polydisperse and that they probably do not contain distinct fractions of uniform molecular weight.

From the sedimentation constant of 1.83×10^{-13} and the intrinsic viscosity of $0.115 \text{ (g./100 ml.)}^{-1}$, the sedimentation average molecular weight is calculated to be 2.5×10^4 . The molecular weight distribution cannot be accurately estimated from current data but approximately 90 per cent by weight of the humic acids have molecular weights distributed below 3×10^5 .

Viscosity, surface tension, and conductivity measurements indicate that the critical micelle concentration for sodium humate lies in the range of 16 to 21 g./l. for 0.26 M sodium chloride solutions at pH 6.0 to 7.0. The solutions used for the sedimentation determination of molecular weight had concentrations well below the critical micelle concentration and, hence, the data are not distorted by association of the molecules in solution.

The approximately linear increase of the barium ion exchange capacity of the humic acids KYL-303 from 48 meq./100 g. at pH 2.1 to 358 meq./100 g. at pH 7.0 and the absence of sharp inflection points in the potentiometric titration curves for sodium humate give evidence of a wide and continuous range of apparent ionization constants, as expected for a large molecule bearing a number of reactive groups. The titration curve is consistent with a model consisting of one carboxyl group for every three rings and one phenolic group for every four rings based on a six membered ring structure.

Fractional dialysis measurements, using Carr's calibrated collodion membranes, indicate that the weight average molecular weight is above 3×10^4 and in the order of 7×10^4 . The usefulness of these membranes, however, is seriously handicapped in the molecular weight range above 2×10^4 by the high sorption of the humic acids by the membranes of larger pore size. Osmotic pressure measurements lead to a number average molecular weight of 6.5×10^3 . Such differences in the number, weight, and sedimentation average molecular weight are to be expected in a polydisperse system.

The absorbance of the humic acids in the visible and ultra violet spectra increases rapidly with decreasing wave length and no peaks are distinguishable. The humic acids follow the Beer-Lambert law, and the absorbance can be used to measure their concentration. In dialysis solutions, by using a pair of wave lengths, the optically measured concentrations were in good agreement with results from acid precipitation.

Microfilm \$2.50; Xerox \$5.80. 119 pages.

ENGINEERING, ELECTRICAL

MAGNETIC RESONANCE PROPERTIES OF MAGNETITE BELOW ITS TRANSITION TEMPERATURE

(L. C. Card No. Mic 60-910)

Donald Bryan Bonstrom, Ph.D.
University of Minnesota, 1959

Magnetite is known to undergo a phase transition near 120°K , during which its structure changes from cubic (above T_c) to orthorhombic (below T_c) symmetry. While the change is too small to be detected by x-ray methods, great changes are wrought in some of the electrical and magnetic properties. In addition a magnetic field applied to the crystal in the temperature range just below T_c affects the orientation of the orthorhombic axes relative to the cubic system. Using ferromagnetic resonance methods at K band frequencies this action of the field was investigated and the anisotropy constants in the orthorhombic phase were evaluated for temperatures down to 2.3°K .

A magnetic field applied in the temperature range from $85^{\circ}\text{K} - T_c$ was found to establish the cubic 100 axis nearest it as the orthorhombic c-axis throughout the crystal, the magnitude of the field needed to accomplish this increasing monotonically at $|T - T_c|$. The orthorhombic a and b axes then lie along the 2 cubic 110 directions perpendicular to the c axis; in general the crystal is twinned because of the 2 possible orientations of the a-b system. It was found that a second field, less than that necessary to pull the c axis, applied along one of the possible a or b directions in the temperature range from $80 - 90^{\circ}\text{K}$ de-twins the sample, establishing this direction throughout the crystal as the b axis.

The anisotropy constants, defined on the basis of orthorhombic symmetry, were found to be an order of magnitude higher than those in the cubic phase; they increased gradually as the crystal was cooled, reaching a maximum near 3°K .

Microfilm \$2.50; Xerox \$5.20. 101 pages.

THE IMPEDANCE OF A VERTICAL MONOPOLE ANTENNA OVER A THIN CIRCULAR DISC ON AN IMPERFECT GROUND

(L. C. Card No. Mic 60-1070)

Samuel Wayne Maley, Ph.D.
University of Colorado, 1959

Supervisor: Professor Carl T. A. Johnk

The analytical solution for the electromagnetic field of a vertical monopole antenna above an imperfect ground was published by Sommerfeld in 1909. A thin, circular, perfectly conducting disc placed at the base of the antenna on the surface of the imperfect ground makes the solution much more difficult. In general, it may be said that the addition of the disc to the system has a noticeable effect upon near-zone fields. Accordingly, antenna impedance, which is determined by near-zone fields, is appreciably affected by the addition of the disc. Antenna impedance for systems with circular discs is of considerable practical interest.

This analysis is concerned with the calculation of the antenna impedance at a frequency of about 10,000 megacycles to compare with experimental measurements on a laboratory model of the antenna system. For this purpose, an approximate solution is adequate. Approximate solutions have been published for this problem, but the approximations used were valid only at frequencies much lower than the frequency of interest in this particular case. A more suitable approximate solution for high frequencies is presented, and the results are compared with the results of the experimental investigation associated with this analysis. The comparison indicates reasonable agreement between the theory and experiment.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

THE REARRANGEMENT OF NETWORKS

(L. C. Card No. Mic 60-1246)

Thomas Henry Puckett, Ph.D.
The University of Oklahoma, 1960

Major Professor: John B. Giever

As electronic design techniques have progressed, it has become necessary to find solutions to larger and larger network problems. Likewise, the use of electric network models for the numerical analysis of differential equations calls for the solution of large electric networks, since the larger the size of the network model the more accurate the final numerical results. Unfortunately, the direct solution of even moderate-sized networks, relatively speaking, by inversion of the loop or node matrices quickly exceeds the capacities of present-day computers, or becomes uneconomical. It is therefore necessary to turn to indirect techniques, and the discussion of such a technique is the purpose of this dissertation.

It is shown that a linear map between a pair of finite-dimensional vector spaces, the abstract correspondent of a loop or node matrix, may be inverted indirectly by either of two techniques: embedding the given spaces in larger

spaces, and performing the necessary calculations in the larger spaces; or splitting the given spaces into smaller spaces and making the necessary calculations in the smaller spaces. A complete abstract development of the techniques is given, including proofs of the conditions under which the necessary operations can be performed. The results are also presented in matrix form suitable for immediate numerical application and are seen to be the usual methods of inverting a matrix by bordering or partitioning.

Since abstract discussions of this nature are best presented in terms of vector spaces, the usual techniques of electric network analysis are given in terms of operations in finite-dimensional vector spaces. As a byproduct, it is seen that this formulation allows the immediate recognition of some auxiliary results concerning points of network analysis about which there is some confusion in the current literature.

The use of this formulation allows the relationships between two networks which differ from each other by being "torn" or "pinched" versions of each other to be analyzed, and techniques to be given whereby, if the networks do not differ too much, (1) both networks may be solved at a cost only slightly greater than the cost of solving either one, or (2) if one network is already solved, the known solution may be used to obtain the other solution at only a small additional cost. It is seen that this analysis is appropriate in the case of finding the solution of a network by first finding the solutions of subnetworks of the network, and then interconnecting the solutions.

The specific matrix formulas necessary to perform these operations are given, as well as conditions for existence of the required inverses. It is also shown how the techniques may be applied so that the actual numerical work takes the exact form of inverting a matrix by partitioning or bordering, which in some cases may allow a substantial saving in programming costs.

Microfilm \$2.50; Xerox \$6.20. 129 pages.

MATHEMATICAL ANALYSIS OF SKIN EFFECT IN FOIL-TYPE CONDUCTORS

(L. C. Card No. Mic 60-1044)

Man Young Rhee, Ph.D.
University of Colorado, 1959

Supervisor: Professor Carl T. A. Johnk

In this thesis, several aspects of skin effect in foil-type conductors are investigated. Knowledge of skin effect and surface resistivity on foil-type conductors is of some importance for the design of high-frequency transformer windings; consequently, a survey of skin effect has been made to compare the relative properties of aluminum- and copper-foil conductors. In an insulated foil-type conductor, the distribution of high-frequency alternating current is nonuniform. The nonuniform distribution is a function of frequency; and, at the high frequencies, the current is concentrated in a thin layer at the edge of the foil conductor. If the width of a foil conductor is much greater than the depth of penetration at prominent skin effect, the behavior of a foil conductor toward high-

frequency alternating currents becomes a surface phenomenon rather than a volume phenomenon. A theoretical investigation for quantitative evaluation of current distribution in an aluminum foil conductor is presented in this study. From the current distribution at higher frequencies, the concept of surface impedance and internal inductance have been obtained, is introduced.

The high electrical conductivity of aluminum makes it a logical competitor with copper as a conductor material. Several of the characteristic properties of aluminum and copper are different, therefore, these properties are reviewed. This study is primarily concerned with aluminum conductors, but the properties of copper conductors are presented for comparison. Although the conductivity of aluminum is lower than that of copper, lower conductivity of aluminum results in a better skin effect ratio so that the cross-section of the aluminum foil conductor is used more effectively. However, since copper has a lower resistivity than aluminum, the former reaches a critical temperature at which it may become annealed more quickly than aluminum. Consequently, the problem of insulation may be less difficult with aluminum than with copper. Because of the differences in specific gravity of the two metals, an aluminum conductor will weigh only about half as much as a copper conductor of equivalent length. The advantages of aluminum over copper indicate that an aluminum foil conductor might be recommended after a long range study has been completed.

Microfilm \$2.50; Xerox \$4.20. 78 pages.

CERTAIN PROPERTIES OF DENSE ELECTRON BEAMS, ESPECIALLY AS APPLIED TO A CYCLOTRON-RESONANCE MICROWAVE DETECTOR.

(L. C. Card No. Mic 60-1052)

John Carl Twombly, Ph.D.
University of Colorado, 1959

Supervisor: Professor Willis G. Worcester

Employment of cyclotron resonance in low-voltage electron beams for non-scanning microwave spectrum analysis has met with difficulties in the form of excess beam noise and of values for sensitivity and frequency resolution that fall far short of expected performance. This dissertation documents an analysis of these problems and the establishment and experimental verification of theory for the design of satisfactory cyclotron resonance detectors.

An analysis of high-perveance beams shows the undesirability of permitting operation beyond the critical perveance at which potential within the beam undergoes a cumulative alteration. Examination of this mode of operation establishes an explanation for the high noise values previously noted. A tube designed to avoid this region of supercritical perveance has consistently exhibited experimental noise at the predicted level well below full shot-noise.

An expression is derived which predicts threshold sensitivity in terms of every known design parameter to be encountered. A companion expression is derived for

frequency resolution. Each equation has been experimentally verified to a high degree of accuracy for cases both of a uniform and a non-uniform magnetic field.

As a result of these analyses, conclusions are stated as to frequency range and performance limits to be expected in devices based on this principle. It is submitted that a tube of practical design specifications can be built which may have a center frequency of from 1 to 15 kilomegacycles, a spectrum width of 30 percent of center frequency, a threshold sensitivity of 40 decibels below one milliwatt, and an adjacent channel rejection of at least 40 decibels for channels separated by only 0.33 percent of their mean frequency.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

THE DIGITAL DATA-PROCESSING PROBLEM OF MACHINE TRANSLATION OF RUSSIAN TO ENGLISH

(L. C. Card No. Mic 60-877)

Robert Edgar Wall, Jr., Ph.D.
University of Washington, 1959

Chairman: David L. Johnson

Techniques for the application of digital data-processing equipment to the machine translation of language are discussed; specifically, the translation of written scientific Russian into written English. Some linguistic problems which are significant for the translation process are analyzed. From the results of this analysis, specifications for a special-purpose computer for the translation of language are made. A tentative, general design for such a computer is presented. A machine of this type would be invaluable for research in machine translation and could be used for commercial translation without modification.

The analysis of the linguistic system includes 1) a statistical investigation of the properties of Russian words, 2) a discussion of the constraints imposed on the translation process by the inherent natures of linguistic and digital data-processing systems, 3) a discussion of the effectiveness of interlingual translation and the presentation of an objective measure of the quality of a translation, and 4) the presentation and discussion of translations performed on an IBM 650 computer.

The tentative design of the translating machine is based on a high-speed, high-capacity photoscopic memory. Essentially the machine consists of two coordinated computers: one performing the dictionary search operation with automatic indexing, and the other performing the necessary syntactic processing.

Microfilm \$2.50; Xerox \$8.40. 181 pages.

DESIGN OF MICROWAVE STEPPED TRANSFORMERS WITH APPLICATIONS TO FILTERS

(L. C. Card No. Mic 59-3897)

Leo Young, D.Eng.
The Johns Hopkins University, 1959

Transmission matrices are systematically expressed in terms of "spinor exponentials," which are similar to quaternions, as a preliminary to analyzing ideal transformers.

Inhomogeneous ideal transformers are the subject of Part I. They are defined as non-uniformly dispersive transformers, i.e. the guide wavelength is a function of position. Solutions are obtained for rectangular waveguide transformers of one and two sections. Several numerical examples are given. Two transformers were constructed and the theory was confirmed by experiment.

Homogeneous ideal transformers are the subject of Part II. This case, in which the guide wavelength is independent of position, has been treated extensively before¹⁻⁶. A new point of view is introduced in terms of "unit real" functions, and two important Theorems are proved.

Half-wave filters are defined as cascaded ideal transformers which behave as direct-coupled cavity resonator filters. They can be solved directly or through the quarter-wave transformer. Extensive numerical tables are appended.

The quarter-wave transformer "prototype" is developed as a kind of equivalent circuit for the design of direct-coupled cavity filters. Numerical examples are given. Experimental results are also reproduced and confirm the theory.

Microfilm \$2.70; Xerox \$9.45. 206 pages.

ENGINEERING, MECHANICAL

AN INVESTIGATION OF DEFLECTION AND STRESS DISTRIBUTION IN CORRUGATED DIAPHRAGMS

(L. C. Card No. Mic 60-961)

El-Sayed M. Badawy, Ph.D.
University of Minnesota, 1959

This investigation is concerned with the developments of methods for the determination of the deflection and the stress distributions in corrugated diaphragms of instrument quality. In this thesis, a general analysis of corrugated diaphragms is presented. Expressions for the deflection and stress distribution for the diaphragm subjected to central load or uniform pressure distribution have been derived from a differential equation point of view. The deflection formulas contain the various parameters involved in the design of the diaphragm, e.g. radius of corrugation, number of corrugations, etc..... Additional developments have been made for the deflection of corrugated diaphragms subjected to central loads by dimensional analysis.

The differential equations were obtained by considering the diaphragm as composed of half toroidal shells, each of which is treated as a thin shell of revolution. The equations representing the strained state of a shell of revolution can be reduced to two simultaneous equations which are combined in certain cases into one complex equation depending on a parameter $\mu = \frac{mb^2}{ah}$. The solution of the

complex equation is either asymptotic or has the form of a power series depending on whether μ is large or small. Some of the functions involved in the solutions have been calculated to cover the range of the arc angle met in diaphragm design. From these equations the deflections and stresses can be obtained. More practical equations for deflection which depend upon a factor of proportionality may be derived through simplifications.

A complete stress analysis has been made for a diaphragm subjected to a central load. Using the results of this calculation further recommendations are made for other diaphragms.

Microfilm \$2.50; Xerox \$7.00. 147 pages.

AN ANALYTICAL INVESTIGATION
OF COMBINED FREE AND FORCED
CONVECTION AND A NEW METHOD
TO MEASURE FREE CONVECTION
VELOCITY PROFILES

(L. C. Card No. Mic 60-918)

Roger Eichhorn, Ph.D.
University of Minnesota, 1959

The Prandtl boundary layer equations are reduced to ordinary differential equations and solutions presented for the case of combined free and forced convection with uniform wall temperature and uniform heat flux. It is shown that a class of similar solutions exists for the case in which the external flow is of wedge type ($u_\infty \propto x^m$) and the wall temperature variation follows a power law ($T_w - T_\infty \propto x^n$). The exponents of these power laws are related by the equation $n = 2m - 1$. The parameter governing combined free and forced convection is Gr/Re^2 .

Solutions to the equation were obtained for a fluid with $Pr = 0.7$ (gases) for the two flow situations (constant wall temperature and constant heat flux) over a range $0 < Gr/Re^2 < 100$ for the case in which the buoyancy forces act to increase the flow velocity (aiding flows). For the case in which the buoyancy forces act to decrease the flow velocity (opposing flows), a separation phenomena was found to exist such that at a certain value of Gr/Re^2 the wall shear stress becomes zero. The detailed calculations for the opposing flows were carried out from $Gr/Re^2 = 0$ to the separation point. The results presented are, skin friction, heat transfer and velocity and temperature profiles.

The development of a new method for the measurement of small flow velocities and the application of this method to the measurement of free convection velocity profiles is described. The method employed uses photographic techniques to measure the trajectories of small dust particles ($d < 6.6$ microns) carried along with the flow.

Consideration is given to the various factors which influence such a measurement technique.

The results of the measurement of two laminar free convection velocity profiles are presented and comparisons made with theory.

Microfilm \$2.50; Xerox \$5.60. 111 pages.

AN EXPERIMENTAL MEASUREMENT OF
THE TEMPERATURE DISTRIBUTION IN THE
WORKPIECE DURING METAL-CUTTING

(L. C. Card No. Mic 60-1144)

Milton Bernard Hollander, Ph.D.
Columbia University, 1959

The temperature distribution in the workpiece, confined to the case of a dry, single-pass, (orthogonal) two-dimensional cut of uniform depth and uniform cutting velocity, has been determined by two correlative methods. This dissertation deals with the design and development of the instrumentation employed in the two methods.

The first method of measurement, the thermoelectric, employs a fine-wire thermocouple imbedded into a 0.0010-in. diameter hole drilled on the side of the workpiece. The change in temperature at the thermocouple junction, and its horizontal displacement relative to the cutting edge of the tool are simultaneously registered on an oscilloscope screen during each cut. Between each cut the tool is lowered and the workpiece allowed to return to room temperature. The temperature-displacement data obtained for a number of passes (until the thermocouple is destroyed by the cutting tool) are used to draw the isothermal temperature pattern in the workpiece.

The second method, the radiometric, involves the design and application of a microradiation pyrometer capable of sighting on a 0.0016-in. square spot on the side of a lamblackened workpiece. The infrared radiation from the source on the side of the workpiece is focused on a thermistor detector. Simultaneously, the area under investigation is observed through a microscope eyepiece by reflection from a rotating-chopper mirror, and the workpiece temperature is compared to a blackbody reference source. The signal is recorded in the form of a pulse, and the workpiece temperature pattern is drawn from a number of pulses at several points on the workpiece surface.

This work also includes cutting force measurements. A method of measuring the components of cutting force which employs a tool-type dynamometer is described. The temperature data are used in conjunction with the cutting force data to determine the fraction of shear-zone heat entering the workpiece. The values are compared to those mathematically predicted.

In all cases, the temperature gradient in the workpiece is extremely steep and confined to a region that penetrates the workpiece about 0.030 in. from the machined surface. The pattern may extend a greater distance ahead of and/or behind the cutting tool than it penetrates the workpiece. The temperature in the workpiece (beneath the shear-plane) was not very high. The measured values did not exceed 150 deg F in any instance.

Microfilm \$3.35; Xerox \$11.70. 257 pages.

EXPERIMENTAL INVESTIGATIONS OF THE PRESSURE DISTRIBUTION AND HEAT TRANSFER FOR FLOW OVER CONCAVE HEMISPHERES AND CYLINDRICAL CUPS

(L. C. Card No. Mic 60-930)

Chao Yao Koh, Ph.D.
University of Minnesota, 1959

The incompressible fluid flow over a concave hemisphere and a cylindrical cup was studied both qualitatively and quantitatively. The flow over such geometries was found to be unstable and rotational. The pressure inside the concave hemisphere is equal to the total pressure from the stagnation point to an angle of 75° and decreases from 75° to the edge. The pressure on the solid bottom of a cylindrical cup of 2" outside diameter and $1\frac{3}{4}$ " inside diameter is equal to the stagnation pressure when the depth of cup is $\frac{1}{2}$ " or deeper.

In the case of the cylindrical cup, a porous cup bottom was also utilized to determine the effect of suction on the flow field. For several depths of cup, pressure distributions were measured for different values of suction. It was found that the suction equalizes the pressure distribution.

The convective heat transfer from the concave hemisphere and cylindrical cup immersed in a constant property air stream was measured by means of a transient technique. The heat transfer from the concave hemisphere is 13% lower than that from the circular disk with equal diameter. The free stream turbulence level does not have a significant effect on heat transfer from this geometry. For the cylindrical cup the experimental results as found in the free jet wind tunnel with the free stream turbulence level from 0.5% to 1.12% is by 24 to 49% higher than that of the calculation. The experimental result as obtained in the closed wind tunnel with the free stream turbulence level of 0.11%, deviated from the calculation by 8 to 18%. The effect of free stream turbulence level on heat transfer decreases as the depth of cup increases.

For the cylindrical cup, the heat transfer was also measured when 1% to 5% of suction were created at the bottom of the cup. The measurement was carried out in the free jet wind tunnel. The experimental results agree with the calculation to within 10%. The maximum possible error in the heat transfer measurement is estimated to be 18%. Microfilm \$2.50; Xerox \$7.20. 154 pages.

SOME CONSIDERATIONS OF STICK-SLIP IN THE TWO-DEGREE-OF-FREEDOM SYSTEM.

(L. C. Card No. Mic 60-948)

Horace Eugene Staph, Ph.D.
University of Minnesota, 1959

Bowden and Leben¹ coined a term "stick-slip" to describe the regular jerky motion observed in a slider when it was pulled over a friction surface by an elastic coupling. They attributed this alternate slipping and sticking of the slider to a variable coefficient of kinetic friction. Recent investigators such as Fitz,² Bristow,³ and Heymann⁴ have shown that stick-slip is a result of

the elasticity of the system and will occur for constant coefficients of kinetic and static friction provided the static friction coefficient were the larger of the two.

All of these studies of stick-slip were made on single-degree-of-freedom systems using a constant speed towing carriage coupled to the loaded slider by a spring. Results have been obtained by straightforward analysis of the equations of motion and by recourse to the phase-plane.

This investigation examines the motion of a slider coupled to an intermediate mass and towed by a constant speed carriage through a towing spring. Friction acts only on the slider. The result is a two-degree-of-freedom system. The effect on slider motion of several parameters is made. The parameters are: ratio of slider mass to intermediate mass, m_2/m_1 ; ratio of coupling spring to towing spring constant, K_2/K_1 ; ratio of kinetic coefficient to static coefficient of friction, μ_k/μ_s ; and a non-dimensional term called the "velocity function," proportional to the carriage velocity. The friction was considered constant in nature with $0 \leq \mu_k/\mu_s \leq 1$.

Slider motion was analyzed by using the electronic analog computer to solve the differential equations.

Computer solutions were interpreted and discussed by means of a modified phase-plane.

In general, with small towing speeds, for values of m_2/m_1 equal to and greater than one, the motion of the slider is characterized by nearly regular slips and sticks, very similar to a sine wave, disturbed by the stick periods. The greater the mass ratio the more pronounced is this regularity. For m_2/m_1 less than one the motion is irregular, with groups of short slips and sticks separated by long sticks. For large m_2/m_1 , spring constant ratio did not materially affect the slider motion. For small m_2/m_1 , the variation in spring constant ratio does have effect on slider motion.

Decrease in the velocity function causes little change in the slider motion for large m_2/m_1 except to speed the entire process. When m_2/m_1 is less than one the motion is characterized by long slip periods of many times the duration of slip in a similar one-degree system.

The ratio of the two natural frequencies of the two-degree system provide interesting variations in the slider behavior.

Very small values of μ_k/μ_s may at times cause the slider to reverse its motion temporarily instead of sticking. Very large values of the velocity function aggravate this condition.

Results of some preliminary tests on the effect of length of slider perimeter (edge effect) on the static and kinetic coefficient of friction of bakelite on ice is presented statistically. At the five per cent significance level both coefficients appear to be affected by interaction between slider loading and perimeter.

Microfilm \$2.50; Xerox \$8.40. 183 pages.

1. Bowden, F. P. and L. Leben, "The Nature of Sliding and the Analysis of Friction," *Proc. Roy. Soc. Vol. A* 189, 1947, p. 88.

2. Fitz, C. D., "An Investigation of the Intermittent Motion of Certain Bodies Sliding on Ice," Unpublished Ph.D. Thesis, Library, Univ. of Minn., Minneapolis, June, 1954.

3. Bristow, J. R., "Kinetic Boundary Friction," *Proc. Roy. Soc. Vol. A* 189, 1947, p. 88.

4. Heymann, F. et al., "Friction Apparatus for Very Slow Speed Sliding Studies," *R. Sci. Instr.* Vol. 26, Jan. 1955, pp. 56-8.

ENGINEERING MECHANICS

MEMBRANE DEFLECTIONS AND VOLUME CHANGES IN TANKS AND DOMES

(L. C. Card No. Mic 60-1050)

Richard Joseph Sylvester, Ph.D.
University of Colorado, 1959

Supervisor: Professor Kurt Gerstle

Part I of this thesis is devoted to the determination of the deflections and rotations of a thin-walled cantilevered conical frustum subjected to axial load, torsion, cross-shear, and bending moment. Part II is concerned with the change in containing volume of shells of revolution subjected to axisymmetric loadings. These quantities (deflections, rotations, and volume changes) are most practically used in the determination of spring constants, essential in the analysis of longitudinal and lateral vibrations of liquid-fuel rockets.

The conical frustum considered in Part I is cantilevered from a rigid foundation at the larger diameter of the frustum. A rigid bulkhead to which the various loadings are applied is fastened to the smaller diameter. The frustum is assumed to be a rotationally symmetric shell with a general variation in wall thickness and material modulus along the axis of rotation.

A statically determinate stress distribution is assumed. The internal strain energy is then determined in terms of the applied loadings, and Castigliano's Theorem is employed to establish general integral formulations for the shell deflections and rotations. The effects of shearing strain energy, which are most significant, are included in the formulation. The general integral forms are evaluated for constant material modulus and three thickness variations; constant thickness, linear thickness variations, and hyperbolic thickness variation. A limiting process applied to the integral formulation for deflections and rotations of a conical frustum yields the corresponding equations for a cantilevered cylindrical tank.

The use of the hyperbolic thickness variation to represent a cone of constant skin thickness with longitudinal stringers of constant cross-sectional area is discussed, and the error due to the assumed shear stress distribution is assessed. The phenomenon of reversed rotation under cross-shear and reversed deflection under moment is discussed. A means of designing conical domes for uncoupled bending and rotation is presented.

In Part II of this paper a general integral expression for the exact volume change of a shell of revolution is determined. The general expression is in terms of the original principal radii of curvature of the shell and in terms of the normal and longitudinally tangential components of shell deflection. The result is valid for large deflections, which fact is illustrated by several simple examples.

From the general expression is derived a simpler approximate expression in terms of membrane strains. This expression is valid for small strains. Examples of volume change is oblately spheroidal, toroidal, and conical domes under axial load, uniform pressure, and linearly varying pressure are presented. Some limiting cases of these geometric shapes are examined.

Microfilm \$2.50; Xerox \$5.20. 101 pages.

ENGINEERING, METALLURGY

INTERFACIAL PROPERTIES OF BINARY LEAD ALLOYS

(L. C. Card No. Mic 60-994)

Walter Verney Green, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Philip C. Rosenthal

The objectives of this study were to: determine whether solute elements do or do not segregate to grain boundaries in solid solution alloys; determine those parameters which control the extent of grain boundary segregation, if it occurs; and measure the effect of grain boundary segregation on grain boundary energy.

In this study, very thin radiographic emulsions recorded the beta particles emitted by very thin samples containing radioactive solute elements. Lead was used as a base metal for experimental reasons. By counting the number of developed grains in the radiographic emulsions and their distribution with respect to the microscopic structure of the samples, grain boundary concentration calculations were possible.

Creep rates and grain sizes in thin wires, and dihedral angles formed at the intersections of grain boundaries with the surfaces in thin foils were measured. The results from these measurements were used to calculate grain boundary energies in pure lead and in the alloys used to study grain boundary segregation.

Grain boundary solute concentrations were greater than the average sample concentrations. Grain boundary concentrations were functions of annealing temperature and time, solute element, atomic size, and, with two of the five alloys, prior specimen history. Graphic analysis demonstrated that grain boundary concentrations reach constant values after sufficiently long anneals at each of the test temperatures.

All the solute elements had atomic sizes that were smaller than the atomic size of lead. Equilibrium grain boundary concentrations of each solute were plotted as a function of the size difference between those solutes and lead, and smooth curves, one for each test temperature, were drawn through the data points. Each curve was quite smooth, was similar to the other curves, and had a maximum value at about 15 per cent atomic size difference between lead and solute.

When grain boundary energy at 312° C for each alloy and pure lead was plotted as a function of the atomic size difference between the solutes and lead, a smooth curve

with a minimum value resulted. The grain boundary energy of pure lead was 195 dynes per centimeter. This value agrees with the only other value reported in the literature and was obtained by another method.

Free-surface surface tensions were reported for each alloy at 312° C, but those did not correlate to any alloying parameters which were considered.

A theoretical analysis explained the dependence of equilibrium grain boundary solute concentration and grain boundary energy on the atomic size of the segregating solute. With strain energy theory, equations were derived that related measured grain boundary concentrations to a distribution function. This function related the size of a grain boundary site to the frequency that this sized site occurs in a grain boundary. The shape of this distribution function was only estimated. This graphic function is probably bell-shaped and centered at the atomic size of the solvent metal. It is less sharp and more smeared out at high temperatures than it is at low temperatures. The analysis showed that the solute lattice site misfit, as well as the grain boundary solvent and solute site misfit, determines equilibrium boundary solute concentration.

Microfilm \$2.50; Xerox \$7.60. 163 pages.

ENGINEERING, MINING

AN EXPERIMENTAL EVALUATION OF EXPLOSIVES IN BLASTING LIMESTONE AND GRANITE

(L. C. Card No. Mic 59-6392)

Harve Preston Nelson, Ph.D.
University of Missouri, 1952

Supervisor: Dr. J. D. Forrester

The purpose of this study was the evaluation of military and commercial explosives. A standardized index of effectiveness was used as the basis of comparison.

Testing was conducted at the Experimental Mine of Missouri School of Mines and Metallurgy at Rolla, Missouri, and at Graniteville, Missouri. At the school mine, 16 drift rounds, 8 slab rounds and 70 quarry tests were made in the dolomitic limestone. This rock, known locally as the Quarry Ledge of the Jefferson City formation, is of Ocdovician Age.

Twenty-seven rounds were fired near the dimension stone quarry of the A. J. Sheahan Granite Company at Graniteville, Missouri, in a pre-Cambrian granite stock. The rock tested is the so-called "Missouri Red Granite."

The military explosives tested were 80/20 Amatol, RDX/Talc./Gel. (Picarmite), granulated TNT, RDX/TNT/Gel., 50/50 Pentolite, and Composition C-3. Commercial dynamites used were 40% and 60% Red Cross Extra Ammonia, Gelex No. 2, 40%, 50% and 60% Special Gelatin, and 50% and 60% Straight Dynamite.

In the underground testing, a standard drift round could not be developed for a direct comparison of the results from the various explosives. The tests showed that most high explosives, whether military or commercial, can be adapted to tunneling. Explosives with different character-

istics require that the drill patterns be varied in order to be successful in blasting.

Single hole tests were used, in addition to 8 types of 3-hole patterns, for the quarry experiments. All the blast holes were drilled vertically to a depth of 8 feet.

Data from the test rounds were assembled in Tables, and an index was developed to indicate the relative, overall character of the results obtained from the tests. Fragmentation, yield, and rock throw were determined from the experiments. These factors then were weighted and computed to establish an index of effectiveness. This index was plotted in graphic form to indicate the optimum hole size and the spacing and burden of holes for the various explosives.

Type III Patterns, with spacings of 5 feet between holes, and a burden of 4 feet, with 2 free faces, was found to be the most effective round in the limestone quarry. Pentolite gave the best results in solidly loaded charges and Composition C-3 gave the poorest results. Different methods of loading were tried with various delay intervals in timing the firing of the shots.

The results of single hole shots compared with 3-hole rounds, loaded in the same manner, indicated that a minimum of 3 holes should be used in limestone quarry testing.

In granite, the first three test rounds demonstrated that the 5-foot spacing and 4-foot burden of the standard limestone round, were too great to produce adequate fragmentation. A pattern with 4-foot spacings and 3-foot burden was adopted for use with the Type I round. The best results were realized from the Type I Pattern. This pattern consisted of two holes on 5-foot centers, 4 feet of burden, and with the third hole offset 3 feet from each towards the face.

Blasting in the granite was affected by the presence of joint fractures, but this is normal for such type of rock.

A table, showing the recommended trial shots for vertical holes, was compiled and has been presented in the complete report of this investigation as a guide for the preparation of a quarry round.

After firing any test, the results can be evaluated for suitability. Increasing the pattern dimensions will give a greater yield; decreasing them will result in better fragmentation.

With reference to the data compiled, it is believed that military explosives can be adapted to quarrying as effectively as commercial explosives but perhaps not as efficiently. Microfilm \$2.85; Xerox \$9.90. 218 pages.

ENGINEERING, SANITARY AND MUNICIPAL

A STUDY OF THE BEHAVIOR OF THE ST. JOHNS RIVER

(L. C. Card No. Mic 60-487)

Edwin Eugene Pyatt, D.Eng.
The Johns Hopkins University, 1959

The behavior of the St. Johns River at Jacksonville, Florida has been studied from extensive and intensive

data collected during 1954 and 1955. Few other estuaries have been so thoroughly and systematically sampled by the method of simultaneously occupying stations around complete tidal cycles. River hydrology, chlorinity distribution, meteorological effects, tidal and current phenomena were investigated. The theoretical distribution of pollution in the St. Johns, which results from the discharge of raw municipal sewage through seventy outfalls, was computed.

However, these calculations did not agree with observed data. While rational techniques proved to be inapplicable in this very much less than idealized mathematical model, an empirical method was developed which permitted an evaluation of water quality and which serves to minimize and clarify future sampling programs.

Microfilm \$6.10; Xerox \$21.60. 478 pages.

FINE ARTS

**CHARLES DEMUTH: HIS LIFE,
PSYCHOLOGY AND WORKS.
(VOLUMES I-III).**

(L. C. Card No. Mic 60-1180)

Emily Edna Farnham, Ph.D.
The Ohio State University, 1959

This study included the preparation of a biography of Charles Demuth's life, a study of the homosexual factor in his personality, and an analytical examination of his works. In connection with the section on the works, the artist's paintings and drawings were catalogued, cross-catalogued and illustrated.

Facts about Demuth's life were gathered from published materials and through correspondence, questionnaires, interviews and visits to the artist's home in Lancaster, Pennsylvania. Writings by Freud and Ernest Jones relating to homosexuality were investigated, and the advice of a competent expert in abnormal psychology was sought. In the section on the works, a chronological study was made from the standpoints of subject matter, approach to subject matter, and style. The comparative method was used in isolating influences and in attempting to determine the artist's stature in relation to his contemporaries. In the compilation of the catalogue of works, actual paintings were viewed and measured whenever possible. A canvass of Demuth works in American museums, in galleries and in private collections was conducted; letters were mailed to purchasers of Demuth works at auction; and the earlier Weyand catalogue of Demuth works was incorporated in this one.

Demuth's life was marked by periodic visits to various Bohemian colonies and the advent of two debilitating diseases. His complex mind was carefully guarded behind "a curtain of mental privacy" and a gay, sophisticated façade. It was established that Demuth visited Paris in 1904, 1907-08, 1912-14 and 1921; and that he was interned in Dr. Allen's Psychiatric Sanitarium at Morristown, New Jersey, in 1922 and 1923. He received his art education primarily at the Pennsylvania Academy of the Fine Arts; was initially sponsored in New York by Charles Daniel, becoming officially a member of the Stieglitz Group in 1925; and died from the effects of diabetes in 1935.

It is believed that Demuth's works may reflect the homosexual side of his nature in that toward them he may have enacted the rôle of the "nurturant mother," himself the love-object in his paintings--hence the prolific output.

A many-faceted artist who reached early maturity at thirty-one, Demuth painted for two decades thereafter, producing works in seven subject-matter categories. His works were found to divide readily into two major periods: early Mannerist-Expressionistic paintings in which the artist was absorbed with subject matter, and late Cubist-Abstract works in which he was absorbed with the problem of pictorial form. Early influences were discovered to include those of El Greco, Toulouse-Lautrec, Fragonard, Blake, Kandinsky, Rodin, Nolde and Pennsylvania German folk art; late influences, those of Cézanne, Picasso, Braque, Gris, Metzinger and Léger.

Demuth's works were compared with those of such contemporaries as Marin, Feininger, Sheeler, Stella, Duchamp and Hartley, in company with most of whom he was a pioneer in the modern movement in art in America. During the course of this study, however, it became clear that it is primarily as a versatile artist whose works contain superb structure, great vitality, rare psychological-erotic self-expression and universal appeal that Demuth deserves to be remembered.

Microfilm \$13.65; Xerox \$48.80. 1084 pages.

FIVE HUNDRED LOHANS AT THE DAITOKUJL
[Microfilm does not include illustrations;
VOLUME ONE only].

(L. C. Card No. Mic 59-1552)

Wen Fong, Ph.D.
Princeton University, 1958

The hundred pictures depicting the Five Hundred Lohans (Buddhist saints) once kept at the Daitokuji monastery in Kyoto, Japan, were originally made in the south-eastern coastal province of Che-chiang in China during the last quarter of the twelfth century. Six of these pictures were lost in the seventeenth century and were replaced by copies of a Japanese artist, Kano Tokuo. Ten pictures were purchased from the monastery by the Boston Museum of Fine Arts in 1894. Two other panels were sold to a "private collector" around the turn of the century. For years their whereabouts was not known. Only recently were they identified by the author among the treasures of the Charles Lang Freer Collection in the Freer Gallery in Washington.¹

The illustration of the Five Hundred Lohans was a Chinese development during the Sung period, which culminated, as it were, in the "Daitokuji" cycle (commissioned in 1178 A.D.). As a historical monument, the volume (one hundred pictures) of the series is singularly valuable as it, alone, made the series a comprehensive record of the climactic achievements of that phase of Buddhistic beliefs, and that particular branch of art.

In order to show that the present cycle was a summation of a rapid succession of developments of the representation of Lohans during a period of two hundred and seventy-five years (c. 900-1150 A.D.), all available material - both pictorial and literary - concerning the earlier cycles of the sixteen and the eighteen Lohans is studied in relation to the "Daitokuji" pictures. A pattern of development is thereby recognized. The early icons, which developed as early as the late fifth century but became popular only towards the end of the ninth century A.D., consisted of two major types: One standing type stemmed from early hierarchical representations of Lohans as Buddha's attendants and worshippers, while the other, a seated type was specifically developed for the purpose of Lohan worship. These early icons were solitary devotional images with little or no background setting. During the tenth and the eleventh centuries, the old standing and seated images were adapted into landscape and domestic settings in a rapidly expanding narrative cycle of Lohans. This was done partially because of the rising aesthetic interest in the picturesque, but more particularly in order to illustrate the doctrine set forth by an Indian work known as the *Fa-chu-chi* (translated into Chinese in the middle of the seventh century) which announced that Sixteen Lohans, as living guardian saints, were ordered by Buddha to remain in this world until the future coming of Buddha Maitreya.

Since the earlier cycles showed only sixteen or eighteen Lohans, the artists who had to paint the inflationary five hundred Lohans - which was a purely Chinese creation - faced a critical problem of narrative shortage. To create five hundred different pictures for the Five Hundred Lohans was simply not possible. In the case of the "Daitokuji" series, five figures of Lohans were assigned to each picture, thereby the problem of creating five hundred scenes was reduced to that of a more manageable number of one hundred.

Our last and most extensive literary record in China describes a giant composition of five hundred Lohans which was made by a monk-painter, Fa-neng, in the last decades of the eleventh century. While this picture, according to its description, summed up the existing repertoires of the eleventh century, it appears to have included only half of the subjects that are shown in the "Daitokuji" series, made less than a century later. The other half of the new series represents new, dramatic stories incorporated into the cycle of Lohans during the twelfth century. Seen as a whole, the "Daitokuji" series of one hundred pictures resembles an illustrated encyclopedia of Buddhist ideas and legends of its time. Tao-shih's *Fa-yuan-chu-lin* of the seventh century is cited as a literary counterpart. Just as the latter treats each individual topic in that work in a parallelism of Indian and Chinese texts, respectively called (1) *shu-i*, the definition of the problem according to the translated Sanskrit Tripi-taka and (2) *kan-yin-yuan*, the "Responsive Concurrent Events" in China, so the "Daitokuji" cycle illustrates both

the Indian archetypes and their imitative Chinese legends. It should be noted also that the new subjects added to the cycle in the twelfth century were mostly Chinese legends concerning famous local saints.

Particularly since examples of Chinese painting of the twelfth century are extremely rare, the "Daitokuji Lohans" give us some most valuable specimens of Chinese figure painting of that period. The hands of the two artists who made the hundred pictures can be distinguished on the basis of a comparative study of their respective brush-techniques and compositions. By a further comparison of the original paintings with their modern copies, the basic stylistic principles of these twelfth century paintings are also discussed.

Microfilm \$3.55; Xerox \$12.40. 274 pages.

1. The result of this discovery is to be published shortly in Fong, W., *The Lohans and a Bridge to Heaven*, Washington, D. C.

THE CHICAGO SCHOOL AND
WALTER BURLEY GRIFFIN, 1893-1914.
GROWTH AND DISSEMINATION OF
AN ARCHITECTURAL MOVEMENT AND
A REPRESENTATIVE FIGURE.

(L. C. Card No. Mic 60-1159)

Mark L. Peisch, Ph.D.
Columbia University, 1959

The chief objective of this study is to approach the architectural events centered around Chicago from 1893 to 1914 through the careers of lesser-known designers who cannot rival Sullivan and Wright, but who, nevertheless, made important contributions to the development of modern architecture.

Beginning with a definition of the Chicago School, the study describes the work of only those members who made the most significant architectural contributions. The career of one member in particular, Walter Burley Griffin, is used as a focal point not only because of the breadth of his interests and accomplishments, but also because he was one of the early assistants of Frank Lloyd Wright and himself a pioneer of Chicago design and thought. The importance of Griffin's wife and life-long architectural collaborator, Marion Mahony Griffin, who was one of Wright's chief draftsmen, is stressed. A discussion of Griffin's education at the University of Illinois under the aegis of Nathan C. Ricker, a pioneer of Mid-western education, is shown to reveal in a highly typical manner the methods of architectural training shortly before the turn of the century.

The architectural scene in Chicago around 1900 is described in detail, with the World's Columbian Exposition and the personality and career of Daniel H. Burnham receiving special attention. The influence of the controversial Columbian Exposition is discussed, both its retarding effect on pure design and its stimulus on large-scale group and landscape planning. The Oak Park Studio, which Griffin joined in 1901, is treated with particular attention to Wright and the latter's relationship with his assistants. The contributions made by Wright's pupils

working with him at the Oak Park Studio are outlined, and the advantages and disadvantages of working with the brilliant and original Wright are considered. Wright's position with regard to the Chicago School is suggested as that of a reluctant master rather than as a positive leader of the group. The domestic building of the Chicago School is described particularly through the work of George W. Maher, the firm of Purcell and Elmslie, and the work of Walter Burley Griffin, who began private practice in 1906. The public architecture of the Chicago School and their activity as landscape architects and town planners are stressed as the most important accomplishments of the School. Griffin's activity as a planner of suburban residential communities, his interest in the Garden City Movement, and particularly his residential community in Mason City, Iowa, are described in detail.

The international competition for the planning of Australia's capital city of Canberra in 1911 brings us to the high point of Griffin's career. The status of city planning at that time is discussed, against the background of budding Midwestern communities on the one hand, and the great London Conference of 1910 on the other. In

Griffin's winning plan for Canberra are coalesced such widely divergent influences as the classic Court of Honor in the Columbian Exposition of 1893, and the socially advanced planning ideas of the Scotsman Patrick Geddes. The significant plans of the other competitors are also analyzed.

The study ends with a discussion of work by other members of the Chicago School, both in the United States and abroad. The influence of Frank Lloyd Wright persists as a dominating force, sometimes to the detriment of individual design. The work of the Chicago School is seen as part of a great progressive political movement which is associated with such reformers in the Middle West as Robert La Follette and Jane Addams. The reasons for the School's sudden decline after 1914 are suggested.

Much of the source material for the study came from interviews with survivors of the original group, or from material in possession of their descendants. Unpublished drawings and notebooks from several institutions have been used and are reproduced for the first time. Contemporary architectural magazines were thoroughly consulted.

Microfilm \$3.50; Xerox \$12.15. 270 pages.

FOLKLORE

THE CHILD AND THE SNAKE,
AARNE-THOMPSON 285, 672C, AND
RELATED FORMS IN EUROPE AND AMERICA:
A COMPARATIVE FOLKTALE STUDY.

(L. C. Card No. Mic 60-843)

Butler Huggins Waugh Jr., Ph.D.
Indiana University, 1959

This dissertation is concerned with the historic-geographic analysis of 289 versions of the folktale types listed as Mt. 285 and 672C by Antti Aarne and Stith Thompson, *The Types of the Folktale* FFC #74 (Helsinki, 1928). The most familiar version of the story appeared in Jacob and Wilhelm Grimm, *Kinder-und Hausmärchen* (1815), as nr. 105, "Märchen von der Unke," pt. 1. It had also been included in the 1st ed. (1811) of this same work. Earlier appearances of the story are: a Bavarian diary entry for December, 1646; two versions from "the 17th century" included in Oliver Wendell Holmes', *Elsie Venner* (1862); fragmentary notices in Michael Heberer, *Aegyptica servitus* (1610) and Peter Kalm, *Travels into North America* (1772); Thomas Southey, *The Commonplace Book* (c. 1800); and Charles and Mary Lamb, *Poetry for Children* (1809). From both the historical evidence and what could be derived from the present dissemination of the tale in the oral traditions of Europe and America, the archetype, or original form of the tale is reconstructed, the place of origination established, and the date of origin conjectured.

In addition to the historic-geographic analysis, the problem of typology is discussed, i. e., whether or not "types" do in fact exist and, if so, how are they to be determined or delimited. The tales here studied are generally of the single-motif variety. These kinds of types

raise the problem of analytical inclusion and exclusion, i. e., the difficulties involved in distinguishing between tales which are simply analogous and typologically related, "identical" tales. It was concluded that what we might call a type is a conceptualized abstraction whose limits are defined by similar story structures or patterns, rather than by simple contextual analogies between tales. The comparative units thence become analogous patterns or forms instead of mere similarities in stuff or content. Although the application of such a structural typology seems crucial in the study of single-motif types, the longer, more complex tales probably do not demand it so much. In these latter cases, the complexity of content itself helps delimit the boundaries of the type.

In addition to the study of Aarne-Thompson 285 and 672C, a separate, comparative study of the fable, "The Man and the Snake," (Wienert #133) is included as an appendix. Previous scholarship has made out a case for the derivation of Aarne-Thompson 285 and 672C from this fable. The separate study attempts to show the fallacies involved in this attribution.

From the historic-geographic analysis of the types studied, the following conclusions were drawn. 1) The Child and Snake cycle of tales probably originated at least as early as the 14th century. 2) The original form of the tale would seem to have been somewhat as follows:

A little boy took his bread and milk out into the yard and ate it. A venomous snake regularly came and shared his food. One day he hit it over the head with his spoon and said: "Don't be so greedy -- and get over on your own side of the plate." When his mother heard this, she came out and saw the horrifying scene. She called her husband, and he clubbed the snake to

death. The little boy was grief-stricken at the loss of his friend. He got very ill and almost died.

3) The original home of the type was the Northwestern

corner of Europe or more exactly, perhaps, England. An absolutely precise determination is not possible.

Microfilm \$5.55; Xerox \$19.80. 436 pages.

FOOD TECHNOLOGY

STUDIES RELATED TO THE KEEPING QUALITY OF VACUUM DRIED WHOLE MILK

(L. C. Card No. Mic 60-989)

Curtis Don Degener, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor William C. Winder

One of the principal factors limiting the acceptance of dry whole milk is the deterioration of its flavor during storage. The dried product develops oxidized and stale flavors which are primarily due to changes of the fat and fat-like constituents. This area has received extensive consideration during the past 40 years. Much progress has been made, but a thorough understanding and conclusive solution to the problem is not yet available.

The prime concern of this work was to study and attempt to improve the keeping quality of vacuum dried whole milk. This was accomplished by exploring various treatments. Only limited protection to the vacuum dried whole milk was observed as a result of: the addition of trypsin, the addition of rennet extract, the addition of divalent manganese, and pH adjustment. Those treatments showing more promising results received further consideration.

The fat content of the vacuum dried milk was shown to have a substantial influence on the subsequent flavor stability during storage at 22°C. Some improvement in keeping quality was evident when the fat level was reduced from about 28 to about 16 per cent. When the fat level was reduced to approximately eight per cent or less the product was considered to be satisfactory throughout 180 days.

Packaging with an oxygen scavenger, glucose-oxidase-catalase system, afforded some protection to the product during storage at -14°C (stored initially five days at 24°C), 12°C, and 22°C. The treated series were always better than the untreated control series. At the two lower temperatures of storage the treated series were considered to be satisfactory throughout the storage period of 150 days. During storage at 22°C, the treated series generally attained a questionable range of acceptability after about 90 days.

Improvement in flavor stability of the treated over the control series was observed, particularly after 90 days of storage, when the metal chelating agent, salicylaldehyde, was added to the concentrate before drying. When salicylaldehyde was added directly to the butter oil, before emulsification with fat and phospholipid-poor skim milk, limited improvement in flavor stability of the dried product was noted during the initial 90 days of storage.

Pure butter oil and pure butter oil fractions and centrifuged skim milk were used to prepare modified dried

products which contained less than the normal level of phospholipids. During storage at 22°C, these products were seldom criticised for possessing an oxidized flavor, but developed primarily a stale flavor. An increase of varying degree in peroxide values was noted in all series after 180 days. However, in similar modified dried products which had been prepared with hydrogenated butter oil and hydrogenated butter oil fractions, no increase in peroxide values was evident after the same conditions of storage.

Modified dried milks were prepared from extracted skim milk (alcohol-ether extraction procedure) and pure butter oil. These products contained less than one-tenth the normal level of phospholipids in relation to the total fat. Even in the presence of only this small quantity of phospholipids, the butter oil containing products developed a characteristic stale flavor during storage at 22°C.

The over-all deterioration of vacuum dried whole milk seemed to involve both the phospholipid and fat constituents of the product. Certain aspects, as indicated by these results, deserve further consideration in providing a solution to the problem of the keeping quality of vacuum dried whole milk.

Microfilm \$2.50; Xerox \$5.80. 117 pages.

FORMATION OF PYRROLIDONECARBOXYLIC ACID IN PROCESSED FRUIT AND VEGETABLE PRODUCTS AND ITS EFFECT ON FLAVOR

(L. C. Card No. Mic 60-1011)

Abid Ali Mahdi, Ph.D.
The University of Wisconsin, 1960

Supervisors: Drs. K. G. Weckel and A. C. Rice

Numerous deteriorative changes occur in canned fruits and vegetables during processing and storage, including destruction of vitamins, loss of color and desired flavor, and development of off-flavors.

One of the deteriorative changes that has been found to occur in canned foods is the formation of pyrrolidone-carboxylic acid (PCA) as a result of decomposition of glutamine or glutamic acid. The present investigation was undertaken to determine the precursor or precursors of PCA in food products, the extent to which this acid may occur in a variety of canned foods and its effect on flavor.

Glutamine, glutamic acid and PCA were determined in a variety of canned foods by partition chromatography using a silicic acid column. Determinations were made prior to and after heat sterilization and during storage at

three different temperatures, to determine the extent to which glutamine and glutamic acid contributed to the formation of PCA.

The effect of PCA, both naturally occurring and added, on flavor of certain canned food products (sweet corn, green beans, tomato juice and beets) was evaluated organoleptically by a trained taste panel.

The results indicated that PCA was absent from those products having no glutamine. In all products having measurable quantities of glutamine, PCA was present after processing and during storage. An inverse relationship was found to exist between the glutamine lost and the PCA formed. That PCA was formed from glutamine was indicated by the fact that the summation of glutamine content (glutamine plus PCA times 1.13) remained constant during the entire period of storage.

Conversion of glutamine to PCA followed a first order reaction and the rate of conversion was dependent on temperature; the higher the temperature the greater the rate.

Although glutamic acid was found in all products analyzed, its concentration remained stable throughout the processing and storage periods, regardless of the extent to which PCA was formed in the particular product.

The canned foods studied could be placed in two groups. The first group included low and medium acid foods sterilized at 240 - 260° F., and was characterized by the fact

that all free glutamine was converted to PCA during heat sterilization. The second group included high acid foods processed at temperatures below 212° F., and was characterized by the fact that heat sterilization caused incomplete conversion of glutamine to PCA. The conversion of glutamine continued during storage at a rate dependent on the storage temperature.

The effect of PCA on the flavor of processed foods was dependent on the type of food and on the initial PCA concentration. PCA caused an off-flavor only when its concentration exceeded a certain level, which varied with different products. Five hundredth per cent (0.05 per cent, w/v) was sufficient to produce an off-flavor in sweet corn and tomato juice. Higher concentrations were necessary to cause similar effects in peas and green beans. In beets, flavor constituents were influenced by conditions such as soil type, weather, rainfall, locality and harvest time, and PCA seemed to have little effect on the preference of the beet samples evaluated.

A survey of a wide variety of commercially canned food products revealed that the level of PCA was low in most of these processed fruits and vegetables. It would not be a factor in flavor deterioration, or off-flavor development in most of the food products studied.

Microfilm \$2.50; Xerox \$4.40. 82 pages.

GEOGRAPHY

THE GEZIRA SCHEME IN THE SUDAN

(L. C. Card No. Mic 60-1128)

Khattab Saggar Al-Ani, Ph.D.
Columbia University, 1959

The Gezira Scheme in the Sudan is an irrigation project covering about one million acres of land in the five-million acre clay plain which lies between the White and Blue Niles and has its apex at Khartoum. The area contains a population that is estimated at roughly 650,000 persons dispersed among some 990 villages. Cotton production is the major focus of activity in the Scheme, but from the standpoint of human needs, the subsidiary crops are of no less interest.

In pre-Scheme days, the Gezira population was living a semi-pastoral life under a typically tribal organization, and when the Scheme was initiated, a social and economic revolution occurred which produced marked changes in the social and economic life of the inhabitants. The Scheme began operating in 1925 after fifteen years of pilot experiments, and after many vicissitudes. It is generally considered to be a marked economic success. It is today the "dynamo" of the Sudan, the main contributor to national revenue, providing about half of the country's governmental income.

The Gezira Scheme has often been considered a prototype to demonstrate certain techniques in the development of under-developed areas. It is a good example of cooperation between a country having the knowledge of modern

technology and capital and the people of a country which has not yet advanced far in development. It is an experiment designed to develop a spirit of cooperation and social progress, while at the same time avoiding the disasters of the land-tenure system which dominates considerable parts of the Arab World.

The project development is significant to the geographer for a variety of reasons. Starting with a subsistence economy, and developing a well-organized, commercial, cash-crop system in less than half a century, the Gezira offers for study a large number of transitions taking place in a relatively short period. It is significant, too, because it shows the interplay of state initiative and private enterprise in a partnership relation with the local inhabitants, a partnership which suggests possible application to underdeveloped countries. It is important, also, because many of the problems which arose in the Gezira development still exist as obstacles to development in under-developed countries.

The accomplishments of the Gezira Scheme are many. First, the standard of living of the Gezira tenants had been raised to a level which can be compared favorably with that of other farmers in Africa and the Arab World. Second, the fear of famine, which had spread its shadow over the Gezira for centuries, has been removed due to a guaranteed food crop for the people and their livestock. Third, the local inhabitants have acquired a general knowledge and awareness of modern world affairs after having led a semi-nomadic life isolated from the outside advanced communities. Microfilm \$5.15; Xerox \$18.25. 403 pages.

THE ROLE OF FLORICULTURE IN THE AGRICULTURE OF FLORIDA

(L. C. Card No. Mic 60-863)

Fleming Stanley Moore, Ph.D.
University of Washington, 1959

Chairman: G. Donald Hudson

Agriculture is an important activity within the Florida economy. Of its component parts, it is the specialty crops which are most valuable and distinctive. Two of the three leading divisions of specialty crops, citriculture, and truck farming, are long established and well known. The third, floriculture, is much more recent in its appearance and is relatively unstudied as a whole. Florida is outstanding in the nation as a floricultural producer and the crops involved play a significant role in the total Florida agricultural picture, as well as being of dominant importance in certain counties. Floriculture's rise to prominence has been so rapid that written material about it is not abundant, and statistics are conspicuously inadequate. In studying it, much reliance has been placed on the field interview technique.

Although the floricultural industry has established itself in Florida in response to certain climatic advantages of the state, there are certain areas of optimum thermal environment which have become the particular sites of the floricultural industry today. The component crops did not in some cases begin where they are now located, but had to search for these optimum areas.

Of the five basic subdivisions of floricultural crops--gladiolus, chrysanthemums, ferns, foliage plants, and miscellaneous flower crops--the first remains the largest single crop produced, as well as being one of the earliest grown, but the aggregate value of foliage plants has expanded so greatly since this study was undertaken, that they stand in place with respect to value among the five subdivisions.

Gladiolus are not particularly selective as to the soil in which they grow, but usually it is some type of sandy loam. Relative protection from frost is the major environmental consideration, although irrigation must be available for the growing season which occurs during the drier part of the year in Florida. Gladiolus are grown in three major and two minor areas in peninsular Florida. The leading areas are centered on the cities of Ft. Myers, Bradenton, and Delray Beach; the two minor ones, on Sanford and Hastings. Chrysanthemums are located mainly in the vicinity of Stuart, with Ft. Myers being the center of the second-most-important producing area. Foliage plants are principally grown in the Lakes Area near Orlando and around Miami, while ferns still center in their original producing area in Volusia County.

All these areas were subjected to an unusually cold winter in 1957-58, and displayed varying degrees of thermal protection. The more southerly areas stood up better, and a trend to diminishing production in central Florida will probably continue. Factors other than weather hazards playing a role in redistribution of floricultural production include urban encroachment, increased cost of waterfront and highway-front property, and the necessity for rotating crops on new ground.

Floriculture has become a well established and relatively stable branch of Florida's agricultural economy,

but labor is becoming more expensive and profits are less than previously. Economies of production must be practiced. The demand for some of the constituent crops has not been met yet, and there is scope for expansion in foliage plants and miscellaneous flowers, particularly. Hence the continuance of floriculture as a significant segment of Florida's agriculture seems assured.

Microfilm \$2.70; Xerox \$9.45. 208 pages.

GEOGRAPHICAL ANALYSIS OF CUSTOMER MOVEMENTS AND RETAIL BUSINESS LOCATIONS: (1) THEORIES, (2) EMPIRICAL PATTERNS IN CEDAR RAPIDS, IOWA, AND (3) A SIMULATION MODEL OF MOVEMENT.

(L. C. Card No. Mic 60-868)

John David Nystuen, Ph.D.
University of Washington, 1959

Chairman: William L. Garrison

The subject of this study is the relationship between location of retail businesses in an urban area and associated movements of people to these businesses on shopping trips. The major proposition advanced is that the spatial arrangement of retail stores into shopping centers of different sizes is, in part, an adjustment of the location of stores by retail entrepreneurs to take advantage of customer desire to combine shopping purposes on trips. Consequently, customer travel behavior is a factor in the location of retail stores.

Inclusion of postulates describing customer travel behavior in a general theory of retail store location provides an explanation of why retail stores locate in centers which vary in number of stores and in types of goods and services offered.

The study is divided into three major parts: (1) a discussion of the relevancy of certain theories for analysis of the relationship between location and movement, (2) empirical observations on patterns of store associations in retail shopping centers and associations of purposes on shopping trips by customers, and (3) an investigation of the feasibility of using a simulation model for prediction of combinations of shopping purposes on trips from the spatial association of business types in shopping centers.

An analysis is made of the manner in which location, central place, and urban real estate theories implicitly or explicitly define characteristics of the movement of people between locations. Modifications of these theories to include the role of multiple purpose shopping habits of customers are presented. The results modify the explanation of both store location and customer movement.

A report is presented on empirical observations describing actual distribution and association of retail businesses by type of business in an urban area (Cedar Rapids, Iowa). The patterns of customer movement to the retail establishments in this city are described with information based on detailed records of movements made by a sample of people in the city. The data reveal a hierarchical arrangement of retail centers by the range of functions offered, and the number and kinds of purposes

associated in shopping trips. The empirical results are compared with the expectations of the behavior of these elements in theory.

An example of a simulation model is presented which demonstrates the feasibility of using such a method to predict the number and kinds of purposes associated on customer shopping trips from the spatial arrangement of retail business types throughout the city. Comparison of the results of this prediction with actual data on movement is encouraging. The method is operational and should be a useful tool for future studies of movement and related phenomena.

Microfilm \$2.50; Xerox \$7.80. 169 pages.

A DETERMINATION OF CONSERVATION PRINCIPLES AND CONCEPTS DESIRABLE FOR USE IN THE SECONDARY SCHOOLS

(L. C. Card No. Mic 60-312)

Halene Hatcher Visher, Ph.D.
Indiana University, 1960

Please see abstract on page 4005.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

GEOLOGY

A STATISTICAL ANALYSIS OF CONODONTS FROM THE UPPER DEVONIAN OF MISSOURI

(L. C. Card No. Mic 59-6374)

Jessie Bird Ellis, Ph.D.
University of Missouri, 1959

Supervisor: Maurice G. Mehl

A representative part of the conodonts of the Holts Summit formation (Upper Devonian) of central Missouri was analyzed in order to determine the numerical distribution of the paragenera present in the conodontiform population. It was shown that although the conodonts were of a certainty transported, they had not been differentially sorted either according to shape or size, and were representative of a biocoenose.

The count of paragenera demonstrated that the conodont population of the Holts Summit is characterized by the great number of plate-like forms present; the paragenus *Palmatolepis* makes up about half of the total. This abundance of plate-like forms sets the Upper Devonian fauna apart from the Mississippian and Pennsylvanian faunas, which are dominated by hindeodellids.

The analysis of this fauna gives no direct information of the details of the conodont composition of the conodont bearing animals. But from the numerical distribution of the differently shaped conodonts there is indirect evidence that two major groups of conodont bearing animals were present in the Holts Summit population, one bearing only one conodont paragenus, and another which bore a conodont complement of three or four paragenera. The simple cones, and several of the plate-like conodonts probably were uncombined in the animals which bore them. On the basis of shape grouping at least four different groups of conodont assemblage bearing animals were indicated.

The above grouping does not necessarily imply that the Holts Summit conodont population consisted of six or more families of conodontiforms, although it might be so interpreted.

The statistical analysis of this conodont count does not justify a more definite conclusion concerning associated parts than suggested above. It does give added strength to

Müller's conclusion that his Upper Devonian conodont collections constituted a complete faunal picture rather than one distorted by transportation vagaries.

Microfilm \$2.50; Xerox \$6.00. 121 pages.

SURFICIAL DEPOSITS, GEOMORPHOLOGY, AND CENOZOIC HISTORY OF THE EUREKA QUADRANGLE, UTAH.

(L. C. Card No. Mic 60-1038)

Harry Donald Goode, Ph.D.
University of Colorado, 1959

Supervisor: Zena M. Hunter

The Eureka, Utah, 7½ minute quadrangle is about 65 miles south-southwest from Salt Lake City. The main divide of the East Tintic Mountains, one of the easternmost Basin Ranges, crosses the quadrangle from its northwest corner to the center of its southern border.

Rocks of the quadrangle range in age from Early Cambrian to Recent, but Pennsylvanian to Cretaceous rocks are absent, owing to nondeposition or to subsequent erosion. Nearly 10,000 feet of Paleozoic rocks were folded into a north-trending asymmetric syncline whose western limb is nearly vertical. Except where they have been stripped off the older rocks, Middle Eocene tuffs, flows, and intrusive rocks that are as much as 2000 feet thick cover the Paleozoic rocks.

Surficial deposits of the area consist of loess; alluvial and colluvial silt, sand, and gravel; and lacustrine deposits of Wisconsin Lake Bonneville. The age of the surficial deposits has been related to Lake Bonneville: the loess and certain alluvial-colluvial deposits are of pre-Lake Bonneville age; the lake deposits are of Lake Bonneville age; and other alluvial-colluvial deposits are of Lake Bonneville or post-Lake Bonneville (Recent) age.

The loess of pre-Lake Bonneville age is probably the oldest surficial deposit. The loess blanketed the area, perhaps in Yarmouth time, and its silt-size grains of

quartz were later eroded from the original deposits and were redeposited in most younger deposits. This silt probably was a source for the fine-grained deposits laid down by Lake Bonneville.

Extensive alluvial and colluvial gravels of pre-Lake Bonneville age occur in many canyons and along the mountain fronts. These gravels are overlapped along the quadrangle's eastern edge by lacustrine deposits of the Alpine and Bonneville formations of the Lake Bonneville group. The Provo formation, youngest member of the Lake Bonneville group, was not deposited in the quadrangle because the lowest point in the quadrangle is about 100 feet above the Provo shoreline. Alluvial silt and gravel have been correlated with formations of the Lake Bonneville group.

Recent alluvium and colluvium of silt, sand, and gravel partly fill most valleys and overlap Lake Bonneville deposits along the eastern edge of the quadrangle.

The landscape of the quadrangle has been controlled by the complex geology of the area. Differential erosion on rocks of many lithologies, volcanic activity, and uplifts by block faulting produced a dynamic mountainous landscape, whose major divide is even now moving from east to west. This movement of the divide, activated by an 850 foot difference in altitude between eastern and western base levels, is manifest on the eastern slope in stream piracy, landslides, and steep canyons, whereas on the western slope the topography is sub-mature.

Features of the present landscape include 1) exhumed pre-volcanism rugged topography of the Paleozoic rocks near the axis of the syncline, 2) several uplifted erosion surfaces, 3) the large, wedge-shaped, uplifted Diamond Divide Block, 4) several areas whose accelerated erosion is due to structural or lithologic weakness of the bedrock, and 5) periglacial features such as inactive talus slopes and buried frost-action deposits.

Study of the rocks and physiography indicates that after Middle Eocene time volcanic rocks covered the folded and faulted Paleozoic rocks. The area then underwent extensive erosion that increased after periods of block faulting. Late Tertiary rocks were probably deposited in the adjacent basins but these rocks were covered by conglomerate, alluvium, and lacustrine deposits of Pleistocene age. A cycle of 1) erosion in the mountains, 2) erosion and deposition in the foothills, and 3) deposition in the basins continues today.

Microfilm \$2.50; Xerox \$8.60. 186 pages.

GEOLOGY OF WAGONER COUNTY, OKLAHOMA.

(L. C. Card No. Mic 60-1243)

Raymond W. Govett, Ph.D.

The University of Oklahoma, 1960

Major Professor: Carl C. Branson

Wagoner County is in northeastern Oklahoma on the southwestern side of the Ozark Uplift and north of the McAlester Basin. The topography of the county is characterized by shale valleys between sandstone cuestas. The County is drained by the Arkansas, Verdigris and Grand Rivers, and their tributaries.

Mississippian rocks on the surface in Wagoner County are in the Osagean, Meramecian and Chesterian series. The Mississippian formations that crop out are the Reeds Spring and Keokuk, in the Osagean; the Moorefield, in the Meramecian; and the Hindsville, Fayetteville and Pitkin, in the Chesterian. Pennsylvanian rocks in the County are in the Morrowan, Atokan and Desmoinesian series. The Desmoinesian series has been divided into the Krebs, Cabaniss and Marmaton groups. Pennsylvanian formations are the Hale and Bloyd, in the Morrowan; the Atoka, in the Atokan; the Hartshorne, McAlester, Savanna and Boggy, in the Krebs; the Senora, in the Cabaniss; and the Fort Scott, Labette and Wetumka, in the Marmaton.

Rocks in Wagoner County generally dip to the west or southwest 50 to 60 feet to the mile. This homoclinal structure is locally interrupted by faulting and folding. Faults in the area usually have a northeast-southwest trend, and all are normal faults.

Mississippian time was characterized by deposition of limestone and shale. Lower Morrowan rocks in the area grade southwestward from calcareous sandstone into limestone and shale. Upper Morrowan rocks are limestone and shale. Older Atokan rocks are progressively overlapped northward by younger Atokan units. Atokan rocks are sandstone, shale and thin, lenticular limestone. Desmoinesian rocks in the County are usually cyclic. Basinal type sandstone and shale were deposited a few times in the Desmoinesian. The remainder of the Desmoinesian rocks are sandstone, shale, siltstone, thin limestone and thin coal.

Unconformities are above the Reeds Spring, Keokuk, Moorefield, Pitkin, Bloyd and Boggy formations.

Wagoner County has abundant limestone, sand, gravel and coal reserves. Limestone deposits are unexploited because no need exists for them and most of the coal deposits have not been mined. Sand and gravel rank behind oil and gas in value of minerals produced. Oil and gas have been produced in Wagoner County since 1914 and new wells are still being drilled. However, petroleum reserves have been largely depleted.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

PETROGRAPHY OF THE STE. GENEVIEVE LIMESTONE IN INDIANA

(L. C. Card No. Mic 60-823)

Seymour Samuel Greenberg, Ph.D.
Indiana University, 1959

Macroscopic examination of rocks yields descriptions that differ from those derived from microscopic inspection, and these in turn differ from descriptions resulting from detailed petrographic examination. The rocks that were the subject of this dissertation were studied by all three of these methods, and the results suggest that much of the confusion in the terminology of carbonate petrography results from different methods of study.

Most limestones examined in this thesis can be adequately described by the adjectives granular, oolitic, lithographic, phaneritic, fossiliferous, porous, chalky, friable, laminated, and massive. Most of the rock specimens from the Ste. Genevieve Limestone are granular.

In 748 thin sections of the St. Genevieve Limestone the constituents are detritus, spar, recrystallized carbonate, and ooze. Detrital constituents include oolites, mud fragments, fossils, and crystals.

Sparry cement that occurs between detrital particles was precipitated in pore spaces; sparry cement that does not occur between detrital particles was formed by recrystallization. Ooze was formed by primary precipitation in waters that contained little or no detritus. Mechanical breakdown changes ooze to angular masses of mud, and transportation changes angular muds to well rounded pellets of mud. Finely comminuted and slightly recrystallized detritus looks like ooze.

X-ray analyses show that most of the Ste. Genevieve is essentially limestone; dolomitic limestone is next in abundance. All observed domomite was secondary.

From youngest to oldest, the members of the Ste. Genevieve are Levias, Rosiclare, and Fredonia. The percentage of mud particles varies inversely with the percentage of crystals in thin sections from all three members of the Ste. Genevieve. Fossils are abundant in all three members, mud fragments are abundant in the Levias and Rosiclare, and crystals are abundant only in the Levias. Fossils are the most abundant detrital constituent in the Levias and Fredonia Members, but masses of mud are most abundant in the Rosiclare.

Detritus in all three members of the Ste. Genevieve was sorted both before and after accumulation at the last depositional site. Oolites are better sorted (sorting coefficient 1.2-1.4) than the other detrital constituents (sorting coefficient 1.6-1.8). Quartz and mud fragments are finer than the other detrital particles, and in the Rosiclare (which contains more mud fragments and quartz) the detritus is finer than the other two members.

All specimens of Ste. Genevieve observed in this study were formed mainly by accumulation of detritus or by recrystallization. Most specimens of the Fredonia and many specimens of the Levias formed in a high energy environment. This energy was sufficient to winnow out the ooze, and subsequently spar was precipitated in the open spaces. Other specimens of the Levias and some specimens of the Rosiclare formed in an environment where the energy was insufficient to remove the ooze. Much of the ooze in specimens of the Levias has been recrystallized. Many of the Rosiclare specimens were formed at depositional sites where no ooze was forming and spar was not precipitated subsequently in the open spaces. Recrystallization has cemented the detritus and reduced the pore space in these specimens of the Rosiclare.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

STRUCTURAL GEOLOGY OF THE EASTERN FLANK OF THE SOUTHERN FRONT RANGE, COLORADO.

(L. C. Card No. Mic 60-1039)

John Conrad Harms, Ph.D.
University of Colorado, 1959

Supervisor: Lawrence A. Warner

The area of study lies approximately 20 to 85 miles south of Denver and follows the foothills belt of the south-

ern Front Range. It is along this belt of steeply dipping Cambrian to Tertiary age beds that the greatest part of the structural relief between the crest of the Front Range and the axis of the Denver Basin occurs.

The major structures of the area are west dipping reverse faults which border 50 miles of the mountain front. These faults place Precambrian rocks in fault contact with beds as young as Paleocene. The stratigraphic displacements may exceed 15,000 feet. The fault surfaces exposed in the southern part of the area dip west 20 to 50 degrees. The downthrown blocks of the major thrusts are steeply dipping or overturned sediments cut by numerous strike and dip faults.

Monoclines occur where thrust faults are absent. Relatively minor anticlines and synclines are found in some places.

It has long been recognized that the main period of deformation followed the deposition of the Upper Cretaceous-Paleocene Dawson formation. Angular unconformities of as much as 40 degrees between the Dawson and the underlying Laramie formation north of Colorado Springs prove that Laramide movement began in this area by late Upper Cretaceous time.

Sandstone dikes in the Precambrian rocks parallel all major and some minor thrust faults. Most dikes occur within one mile of the fault trace and dip more steeply to the west than the fault surfaces. The dike dimensions range from a few feet to more than two miles long, a few inches to three hundred feet thick, and a few feet to at least one thousand feet in vertical extent. Larger dikes show a greater degree of parallelism to the fault strikes. Most dike walls are smooth and show no evidence of catalasis.

The dikes are composed primarily of fairly well-rounded quartz grains which closely resemble those of the Cambrian Sawatch sandstone in size, shape and strain features. The average orientation of long axes of grains parallels the direction of the dip of the dikes. Minor amounts of Pennsylvanian shale and Precambrian rock fragments are also included in the dikes. Crushing and silicification make the dikes more resistant to erosion than the enclosing rocks.

Dike intrusion follows planes perpendicular to the axis of least principal stress. The dike attitudes indicate a stress distribution which could only be associated with thrust faults whose dip steepens with depth. Movement along the fault surfaces lowered the magnitude of the least principal stress in the upthrust Precambrian block sufficiently below fluid pressure in the over-lying sandstones to allow fracture and injection. All dikes are the result of downward intrusion of water saturated sandstones. Such intrusion tended to equalize the stresses in the upthrust wedge.

The dikes near the foothills belt are always associated with Laramide thrust faults. The age of the dikes is therefore considered Laramide. Where dikes occur many miles from the mountain front, Laramide faults are postulated. The location of these faults and their attitudes may not be ascertained by other means within the area of the massive Pikes Peak granite.

The major failures along the flank of the Front Range uplift within the map area are thrust faults which steepen with depth. The boundary forces on a crustal block of large dimensions which are most compatible with these features are predominantly vertical in nature. Uplift of

the crustal block as a result of these vertical boundary forces may have occurred as a step displacement or as a sinusoidal-like warping.

Microfilm \$2.50; Xerox \$7.60. 165 pages.

SEDIMENTOLOGY AND ORIGIN OF THE ALLUVIAL TERRACES ALONG THE WABASH VALLEY

(L. C. Card No. Mic 60-831)

Richard Baldwin McCammon, Ph.D.
Indiana University, 1959

A petrologic study of the terrace gravels in the Wabash Valley has led to an interpretation of the origin of the alluvial terraces which extend from the upper Wabash Valley in Indiana downstream to the junction with the Ohio River. Profiles of the terrace surfaces suggest that five terrace levels are present. Mechanical analyses, determination of roundness of dolomite pebbles (16-32 mm.), and pebble counts in the 16-32 mm. size interval were made on 39 samples collected from different terrace levels.

The sequence of events resulting in the development of the alluvial terraces in the Wabash Valley is as follows:

- 1) During the glacial advance of the early Wisconsin ice sheet (Tazewell subage?), the Wabash Valley was aggraded to a level of valley filling marked by the surface of terrace level No. 1
- 2) After the ice sheet retreated an unknown distance to the north, the valley fill was partially trenched to form terrace No. 1
- 3) During the succeeding readvance of the early Wisconsin ice sheet to a position north of the previous advance, the Wabash Valley was again aggraded but to a lower level than the previous valley fill. The top of this fill now constitutes the surface of terrace level No. 2
- 4) During the interval between the early Wisconsin (Tazewell?) and the late Wisconsin (Cary) subages, the valley fill was partially trenched to form terrace No. 2
- 5) During the glacial advance of the late Wisconsin (Cary) ice sheet, a scour surface was developed on the previously deposited valley fill and which is designated as terrace level No. 3
- 6) Following the retreat of the late Wisconsin (Cary) ice sheet from Indiana, the overflow waters from Lake Maumee (Maumee torrent), which flowed through the Ft. Wayne outlet and down the Wabash Valley for a period of time, cut a surface of planation which is designated as terrace level No. 4 and formed terrace No. 3
- 7) A later period of downcutting prior to the development of the present floodplain cut a scour surface on bedrock which is designated as terrace level No. 5 and formed terrace No. 4
- 8) Development of the present floodplain by the post-glacial Wabash River which formed terrace No. 5

The dispersal of the sediments underlying terrace level No. 4 indicate that at the time of their deposition, the competency of the stream was sufficient to transport all particle sizes of the bed load and that sediments were being continuously added to the bed load downstream by tributary streams.

Microfilm \$2.50; Xerox \$5.20. 102 pages.

STRATIGRAPHY AND DEPOSITIONAL HISTORY OF THE KEARNY FORMATION (LOWER PENNSYLVANIAN) IN WESTERN KANSAS

(L. C. Card No. Mic 60-902)

Dean Alvis McManus, Ph.D.
University of Kansas, 1959

Interpretation of subsurface data from over 700 wells in western Kansas forms the basis for a discussion of the stratigraphic composition and depositional history of the Lower Pennsylvanian Kearny Formation. The stratigraphic description includes an expression of the transitional and transgressive nature of the formation which oversteps progressively older Mississippian rocks to the north and contains overlapping units. The Kearny thickens southward to several hundred feet in the Anadarko Basin and thins on the flanks of the Keyes Dome and Central Kansas Uplift.

Two unnamed members are recognized, each composed mainly of shale, but the lower, thinner, and less extensive one contains local thick sandstone bodies and a culminating clastic limestone phase. The thin, overlapping part of the upper member contains similar clastics reflecting a high-energy level, but the thicker development consists mainly of dark shales with some intercalated coal beds and elongate sandstone bodies. The section is poorly fossiliferous, but associated with the limestones is a crinoid-mollusoid element. Contacts of the formation are relatively distinct except along the wedge edge of the eastern margin, and in the deeper part of the Hugoton Embayment where upper Chesteran rocks are present.

Sediments of the formation are placed in five lithologic classes: 1) microcrystalline limestones, 2) allochemical limestones, 3) chemical-matrix sandstones, 4) detrital-matrix sandstones, and 5) clay rocks. Each class reflects levels of energy in the environment and degree of influence by extrabasinal factors. The lower member is characterized by the second and third classes, the upper one by the first and fifth.

The depositional history of the formation indicates that moderate diastrophism in adjacent areas ushered in the Kearny sea with its deltaic, littoral, and sublittoral environments. Channel sandstones and deltaic deposits were formed near the Central Kansas Uplift and Keyes Dome. A clear-water, open environment of extensive limestone formation was followed by continued northward advancement of the sea and increased subsidence of the Anadarko Basin, producing a paralic domain dominated by lagoonal environments with offshore bars and with periodic invasions of restricted marine, euxinic, and paludal deposits. A rhythmic alternation of deposits is suggested, but a cyclic repetition is not demonstrated. Toward the end of Kearny time the northeastern shoreline lay well up on the flank of the land mass formed by the

Central Kansas Uplift and extended into Nebraska and eastern Colorado. Final retreat of the sea produced an extensive paralic coal basin. Middle Atokan deposition is marked by little disturbance of the underlying sediments, although adjacent regions were effected by diastrophism.

Several sand-shale ratio maps are included with isopachous maps, structural contour maps, and regional cross sections. Descriptions of typical sections of the Kearny members are appended.

Microfilm \$3.55; Xerox \$12.40. 274 pages.

GEOCHEMISTRY OF CARBOHYDRATES

(L. C. Card No. Mic 60-940)

James George Palacas, Ph.D.
University of Minnesota, 1959

Preliminary studies have demonstrated the presence of minute amounts of carbohydrate substances in bituminous sedimentary rocks ranging in age from Ordovician to Tertiary. The reducing environment under which these sediments accumulated coupled with the association of the carbohydrates with other organic molecules and with finely divided inorganic matter probably accounts for the preservation of these compounds.

Treatment of a powdered rock sample of Green River oil shale with boiling 12 per cent hydrochloric acid yielded furfural and 5-hydroxymethylfurfural in the distillate fraction. These compounds, which indicate the presence of pentoses (and/or uronic acids) and hexoses, respectively, were identified by color reaction and absorption spectra.

Having thus established the presence of carbohydrate materials related to pentoses and hexoses in this manner, outcrop and well-core samples were thoroughly cleaned by immersion in chromic acid and subsequent washing with water. After being powdered, each sample (500 g. approx.) was treated with 0.5 N sulfuric acid for 8 to 10 hours on a boiling water bath. The hydrolysis mixture was neutralized with barium carbonate and freed from inorganic matter by ethanol precipitation and by ion-exchange resins. The hydrolyzate from each sample was concentrated *in vacuo* and examined by paper chromatography. The following sugars were tentatively identified: glucose, xylose and arabinose, and possibly galactose and rhamnose (see Table I). The concentration of glucose, which was the dominant component, expressed in mg./kg. of rock sample, varied from 0.14 for the Simpson to 1.3 for the Marcellus sample. In certain of the rock samples there was some indication of the presence of glycerol.

The glucose (180×10^6 to 300×10^6 years old), isolated by the above acid process from the Leonard and the Marcellus formations, was separated by paper chromatography (solvent: pyridine-ethyl acetate-water (2:5:7)) and characterized as the *D*-isomer by transforming it into *N*-p-nitrophenyl- β -*D*-glucosylamine, m.p. and mixed m.p. 184°C , $[\alpha]_D^{20} - 200^\circ$ (approx.) in pyridine (C, 0.1). The mode of occurrence of the carbohydrate compounds in the rock formations is not yet known. It has been shown, however, that in the case of a sample from the Marcellus formation, extraction with water yielded about 10 per cent of the total carbohydrate material as the free sugars,

Table I

The Carbohydrate Components of Sedimentary Rocks

(The rock was treated with hot 0.5 N H_2SO_4 and the sugars identified chromatographically.)

Formation	Age	Component Sugars				
		Glu- cose	Galac- tose	Arab- inose	Xy- lose	Rham- nose
Stonehenge	Ordovician	+		?+	?+	
Simpson	Ordovician	+		+	+	
Oranda	Ordovician	+	?+	?+		
Marcellus	Devonian	+	?+	+	+	?+
Woodford	Devonian	+	?+	+	+	
Des Moines	Pennsylvanian	+		+	+	
Missourian	Pennsylvanian	+	?+			?+
Leonard	Permian	+	?+		+	
Schuler	Jurassic	+		+	+	
Green River	Eocene	+	?+		?+	
Elko	Miocene	+		?+	?+	

arabinose, glucose and xylose; the remaining undissolved carbohydrate material is believed to be present in the polymeric form probably complexed with other organic substances.

Control experiments showed that the sugars did not arise from the materials used in the isolation techniques. These carbohydrate substances are believed to be original constituents of the rocks although in the outcrop samples, despite careful collection and cleaning treatment, the possibility of surface contamination cannot be completely ruled out at this time.

Microfilm \$2.50; Xerox \$6.40. 131 pages.

CRYSTALLINE ROCKS OF THE NORTHERN TOBACCO ROOT MOUNTAINS, MADISON COUNTY, MONTANA.

(L. C. Card No. Mic 60-870)

Rolland R. Reid, Ph.D.
University of Washington, 1959

Chairman: Peter Misch

Earlier workers have held that the pre-Beltian Cherry Creek metamorphics of southwestern Montana are younger than the Pony metamorphics. In the northern Tobacco Root Mountains, Pony metamorphics have been found to overlie Cherry Creek metamorphics. Pony and Cherry Creek metamorphics are not unconformable, as earlier workers have proposed; rather, they are parts of the same depositional unit and have been subjected to the same sequence of metamorphic processes.

Pony and Cherry Creek metamorphics comprise a complex group of rocks, including amphibolitic granulites,

amphibolites, trondhjemitic gneisses, quartz monzonitic gneisses, almost monomineralic microcline gneisses, leucocratic gneisses of varying composition, micaschists, phyllonites, quartzites, marbles, magnetite schists, serpentinites, cummingtonite schists, weakly schistose olivine-enstatite granulites, quartz-bearing albite "anorthosites" (albitites), garnet-bytownite anorthosites, sodic to calcic anorthosites, anthophyllite schists, and metabasalts.

Early in pre-Beltian time, a thick sequence of geosynclinal rocks was isoclinally folded about northeast-trending axes under high grade metamorphic conditions, with the production of recumbent isoclinal folds; this folding was accompanied by metasomatic feldspathization and metamorphic differentiation. Subsequent to this orogeny (deformation No. 1, metamorphism a), basalt dikes and sills were injected into the pre-existing metamorphic rocks, cutting isoclinal folds and migmatitic patterns.

After the emplacement of the basalts, the entire rock complex, including the basalts, was subjected to horizontal shearing deformation (deformation No. 2 and deformation No. 3) in the presence first of granulite facies conditions (metamorphism b, deformation No. 2) and second of amphibolite facies conditions (metamorphism c, deformation No. 3). Basalt dikes and sills acquired a weak schistosity parallel to schistosity in the enclosing metamorphic rocks. Axial plane schistosity of metamorphism a (no mineralogical traces of which remain) was destroyed and somewhat reconstituted during granulite facies recrystallization (metamorphism b), and still further reconstituted during later amphibolite facies recrystallization (metamorphism c). Northeast-trending boudins containing schistosity of metamorphism c were rotated during deformation No. 4, so that their schistosity came to lie at various angles to schistosity in the enclosing rocks.

Still later in pre-Beltian time came a period of concentric folding in which the pre-existing, approximately horizontal schistosity was deformed into large, north-plunging folds (deformation No. 5). Moderate shearing occurred parallel to the pre-existing schistosity in a manner analogous to the bedding plane slip in sedimentary rocks folded by simple bending.

Following all this, in undetermined sequence, occurred large-scale strike-slip faulting and the deposition of the Beltian sedimentary rocks (north of the map area). Next came deposition of the Cambrian and later sedimentary rocks. This deposition was ended by the Laramide orogeny, in which moderate folding and thrusting occurred (deformation No. 6). Andesite, latite, and granodiorite to quartz monzonite were emplaced. Post-granodiorite strike-slip faulting occurred along pre-existing northwest-trending strike-slip faults.

Cenozoic time witnessed the deposition of basin sediments from early Oligocene to Pliocene, erosional removal of much of the basin sediments, Pleistocene glaciation of the higher parts of the mountain ranges, and erosion continuing to the present.

Microfilm \$2.55; Xerox \$8.80. 194 pages.

GEOLOGY OF THE CARNEY LAKE COMPLEX, DICKINSON COUNTY, MICHIGAN.

(L. C. Card No. Mic 60-1220)

Samuel Blain Treves, Ph.D.
The Ohio State University, 1959

The Carney Lake complex of southern Dickinson County, Michigan, consists chiefly of Lower Precambrian gneisses that contain inclusions of older rocks, and minor syenite, granodiorite dikes, and pegmatites; numerous Middle Precambrian metadiabase dikes and some quartz-rich pegmatitic veins; and a few Upper Precambrian diabase dikes.

The inclusions in the gneisses are amphibolite, biotite schist, and metasedimentary rocks. The textural, mineralogical, chemical, and field relationships indicate that the amphibolite and biotite schist are metamorphosed remnants of basalts which covered this area prior to the formation of the gneiss. The inclusions of metasedimentary rocks, now vitreous quartzite, sericitic quartzite, and quartz-biotite schist, are clearly remnants of the pre-gneiss cover which apparently consisted of both sedimentary and volcanic rocks.

Three varieties of gneisses have been identified and mapped: plagioclase biotite gneiss (grey gneiss); plagioclase-microcline-biotite gneiss (composite gneiss); and microcline-biotite gneiss (red gneiss). Field relationships, textural characteristics, mineralogy, and chemical analyses indicate that the grey gneiss is a product of reaction between an invading granitic magma and the volcanic-sedimentary cover. The composite gneiss is a product of invasion and reaction of the granitic magma with the grey gneiss and consists of alternating layers of grey gneiss and quartz and microcline, and the latter being characteristic minerals of the red gneiss. The red gneiss is a product of further reaction of the other varieties of gneiss with the granitic magma.

The gneisses are cut by syenite and by granodiorite dikes. The age relationships are not entirely clear, but the slight soliation of the syenite probably indicates differentiation from the original granitic magma and emplacement during the waning stages of orogeny. The granodiorite dikes are massive and were probably emplaced later.

The lower Precambrian rocks of the complex are cut by Middle Precambrian metadiabase dikes, some of which cut Middle Precambrian sedimentary rocks also. These metadiabase dikes are in turn cut by quartz-rich pegmatite veins. No granitic rocks have been found cutting lower Middle Precambrian rocks in this area, but granitic rocks do cut Middle Precambrian sedimentary rocks in areas to the north of the complex. The quartz-rich pegmatites are tentatively related to these granitic rocks.

The last rocks to be emplaced were diabase dikes. These dikes are unmetamorphosed and are probably the same age as Keweenaw lavas farther north.

The rocks of the complex are foliated and are cut by joints and faults. The foliation trends northwest over much of the complex and dips northeast at intermediate angles. The foliation is broadly subparallel to the boundaries of the complex.

Joints of various types are present. No positive interpretation of their origin is possible at present.

Clearly defined faults near the boundaries of the

complex offset the gneisses and younger Precambrian sedimentary rocks. Analysis of the structural features indicates that faulting is related to compressive forces probably directed from the north and to updoming and swelling of the rocks of the complex during the emplacement of the late Middle Precambrian granitic rocks.

The geologic history is imperfectly known. The earliest event was the accumulation of a mixed series of Lower Precambrian volcanic and sedimentary rocks. These rocks were then intruded by a granitic magma and the gneisses of the complex were formed through reaction with the overlying rocks. In the late stages of the orogeny syenite and granodiorite dikes were emplaced. Erosion of the older rocks and deposition of the Middle Precambrian sedimentary rocks followed. These rocks were then intruded by diabase dikes. All of the older rocks were then metamorphosed and intruded by granitic rocks.

Except for erosion, the last Precambrian event to take place in this area was the emplacement of Upper Precambrian diabase dikes.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

GEOLOGY OF THE SOUTHERN END OF THE MEDICINE BOW MOUNTAINS, COLORADO.

(L. C. Card No. Mic 60-1053)

Dwight Edward Ward, Ph.D.
University of Colorado, 1959

Supervisor: Professor Ernest E. Wahlstrom

The southern part of the Medicine Bow Mountains is bordered on the west and southwest by North Park Basin and on the east by the Front Range and the southern extension of the Laramie Basin. Complex geologic structures have formed where large scale thrust faulting along the west side of the Front Range gives way to simpler structures in the middle and northern parts of the Medicine Bow Mountains. The thesis area of 32 square miles includes the narrow southern terminal ridge of the Medicine Bow Mountains and its western slope between the Canadian and Middle Fork Michigan Rivers.

Precambrian quartz-biotite gneiss and schist in the area resemble and may be of the same age as similar rocks in the Idaho Springs formation near the type locality. Hornblende gneiss and schist, the most abundant Precambrian rocks, are similar to units in the Swandike hornblende gneiss in the southwestern portion of the Front Range. The foliation of the gneisses and schists strikes east to northeast, transverse to the trend of the Medicine Bow Mountains, and dips steeply to the northwest or is vertical. Lenticular bodies of pegmatitic granite and granitic gneiss locally are parallel to the foliation. In the larger granitic bodies, pegmatitic textures of the interior grade outward to aplitic textures at the contacts with the older rocks.

The basal sediments are Permian red beds of the Satanka shale which are overlain by the Permian Forelle limestone and red beds of the Chugwater formation which are mostly of Triassic age. Jurassic sediments include eolian sandstones of the Sundance formation, and shales, sandstones, and thin limestones of the Morrison formation.

In the Cretaceous, deposition of continental-marine Cloverly group sediments was followed by deposition of a thick marine section including the Benton group, Niobrara formation, and Pierre shale.

With the beginning of the Laramide orogeny in late Cretaceous time, seas receded, mountains rose, and sediments were folded and down-faulted into the Precambrian basement, to be exposed later by continued mountain uplift and thrust faulting. Detritus eroded from mountain uplifts during Paleocene formed the lower Coalmont formation in the North Park Basin. The Pierre shale was eroded from the Medicine Bow Mountains and, locally, portions of the Niobrara formation and the Benton group. A transverse fault along the present course of the Middle Fork of the Michigan River marked the southern limit of rapid uplift. Beyond the fault to the south, a thick section of Pierre shale remains in the Never Summer Mountains. Continued erosion exposed Precambrian rocks which were the source of arkosic sediments in the upper Coalmont formation that overlapped the beveled edges of the older formations.

As orogenic movements were intensified, thrust faulting began where a thick section of Coalmont sediments gave way abruptly to a thin section near the mountain front. A sharp fold in the sediments was broken by the Benton Gulch thrust along which an anticlinal east limb moved westward over the overturned west limb for a distance of one to two miles. On the Cameron Pass-North Fork thrust, Precambrian rocks moved westward over the Benton Gulch thrust sheet for a minimum distance of 2 to 3½ miles. Erosion has reduced the sheets to a compound klippe five miles in length in the valley of the North Fork of the Michigan River.

Sills and sikes of dacite and porphyritic rhyolite are associated with a large stock of quartz monzonite of Eocene age in the Never Summer Mountains. Miocene or early Pliocene flows of andesite and porphyritic rhyolite cover the western fourth of the area and are present also along the eastern edge. These flows and minor amounts of tuff and obsidian originated in a volcano in Specimen Mountain to the southeast of the area. Sediments of the White River formation (Oligocene) and the North Park formation (Miocene) were derived largely from volcanic flows that probably were deposited in the investigated area, but that have been eroded since. Wisconsin and probably Illinoian glaciation are indicated by a widespread cover of till in the lower areas east and west of the main mountain ridge.

Microfilm \$2.60; Xerox \$9.00. 200 pages.

PETROLOGY OF THE WOOD RIVER AREA, SOUTHERN ABSAROKA MOUNTAINS, PARK COUNTY, WYOMING.

(L. C. Card No. Mic 60-1230)

William Harold Wilson, Ph.D.
University of Utah, 1960

Chairman: Bronson Stringham

The area described is located in the northern one-third of the Kirwin quadrangle, southern Absaroka Mountains,

Wyoming. Approximately 300 square miles of a hitherto unmapped area have been studied and are here reported on.

Layered rocks are about 5,500 feet thick and range in age from Eocene to Oligocene. The Pitchfork formation (middle Eocene) consists of interbedded volcanic siltstones, sandstones, and conglomerates which rest with angular discordance on the underlying lower Eocene Willwood formation. The overlying Wiggins formation (upper Eocene and Oligocene) is highly variable in lithology. Near the intrusive rocks, it consists dominantly of andesite flows and flow breccias. These grade laterally into massive volcanic conglomerates and sandstones, lenticular flows and breccias.

Andesite, dacite, granodiorite, and rhyolite occur as stocks and dikes. At least eight of the intrusive bodies are believed to represent former vents.

In the northeast part of the area, both the Pitchfork and Wiggins formations have been displaced by 200- to 1,500-foot vertical normal faults. Folds with dips up to 40 degrees also occur here. In the southwest part of the area, a rhyolite stock has intensely deformed the Wiggins for-

mation to the south and uplifted a large block of Paleozoic strata on the north. Elsewhere, the Wiggins is relatively horizontal or moderately folded.

Pyrite-molybdenite-chalcopyrite-bearing quartz veins and galena-tetrahedrite-pyrite veins cut the Wiggins formation adjacent to the granodiorite stocks.

Initially, the primary source of these layered rocks is believed to have been an andesitic magma which was extruded (or erupted) with progressive differentiation from basic to acid andesite up to middle Wiggins time. Contemporaneous with, or slightly later, the flows and breccias were reworked and redeposited by streams and mud flows to form the volcanic conglomerates and sandstones.

Later eruptions of more basic andesite material characterize the upper part of the Wiggins formation. This compositional break may have been caused by the intrusion of a separate andesite magma, contamination of a pre-existing magma, or mingling of magmas of different compositions by regional tectonic activity.

Microfilm \$2.50; Xerox \$7.00. 150 pages.

HEALTH SCIENCES

HEALTH SCIENCES, GENERAL

STATE LEGISLATION, RULES, AND REGULATIONS PERTAINING TO SCHOOL HEALTH SERVICES.

(L. C. Card No. Mic 60-1119)

William Arthur Stebbins, Ed.D.
New York University, 1959

Purpose

The general purposes of this study were fourfold: 1) to survey state legislation, rules, and regulations pertaining to school health services; 2) to determine the attitude of the courts toward the various areas of health service under study; 3) to determine the areas of health service about which there was general agreement among school health authorities; and 4) to recommend, with the guidance of opinions expressed by a jury of competent leaders in school health, those health services for which each state should make provision through state legislation, rules, or regulations.

The health service areas covered in this study were:

- 1) Pupil Health Appraisal; 2) Health of School Personnel;
- 3) Emergency Care Provisions; 4) Communicable Disease Control; 5) Health Counseling and Follow-through; and
- 6) Healthful School Environment.

Method

The laws of the 48 states were surveyed to determine what statutory provisions for school health services were currently in force in each state.

Authoritative publications in the field of school law were consulted to determine the legal status of the various areas of health service under consideration in this study.

Literature dealing with school health services was

searched to find the items of service generally accepted and agreed on by leading authorities in the field of school health.

Finally, 62 recommended services and procedures were submitted to a jury of competent jurisdiction for their evaluation relative to the value of the item for state level legislation, rule, or regulation. No item was included which did not conform to current practice, legal acceptance, and authoritative acceptance.

Results

Fifty-nine of the suggested proposals for state level action were considered by the jury as essential and the remaining three were considered as desirable by the jury. All of the 62 items were included in the recommendations resulting from the study.

The survey of state legislation, rules, and regulations showed wide variation in both the type and amount of legislative direction given by various states.

No accepted health service procedure has been ruled as legally unacceptable.

There is general agreement among authorities regarding the areas of service which should be available to pupils in all schools.

Less universal agreement was found regarding the procedures to be followed to accomplish desired results.

A high percentage of agreement was obtained among members of the jury favoring strong state action to assure the recommended health services in all schools of the state. Microfilm \$3.60; Xerox \$12.60. 277 pages.

HEALTH SCIENCE, NURSING

AN INVESTIGATION OF TOTAL
NURSING NEEDS IN TWO GENERAL HOSPITALS
AND ONE CANCER HOSPITAL
AS A BASIS FOR DETERMINING
THE KIND AND AMOUNT
OF NURSING PERSONNEL NECESSARY
TO MEET THESE NEEDS

(L. C. Card No. Mic 60-1120)

Rosemary Elizabeth Bouchard, Ed.D.
New York University, 1959

The purpose of this study was to investigate the total nursing needs of patients in two general hospitals and in one special hospital for cancer and its allied diseases as a basis for determining the kind and amount of nursing personnel necessary to meet these needs.

The study included patients on the medical services in two general hospitals and those on the Medical General and Medical Neoplasia service in one cancer hospital. Total nursing needs were considered according to cancer patients and patients who did not have such a diagnosis.

A review of the related literature provided evidence that numerous studies had been undertaken to determine adequate staffing patterns. The results of these previous studies re-inforced the general conclusions reached by many others — namely, that nurses are not being utilized to best advantage, and that non-nursing personnel should perform many of the functions currently assigned to the registered nurse. Further review of related literature in other fields supported the idea that needs other than those related to physical care could not be neglected in a consideration of the total nursing needs of the people who happen to be "patients".

Prior to the study, the investigator provided nursing care to a small sample of patients. This resulted in the development of the list of patients' nursing needs and the list of types of behavior exhibited by patients which were checked daily by all nursing personnel who were administering patient care on the ward units selected. The questionnaire for patient use was developed at the same time as were the series of six questions utilized in the semi-structured discussion conducted by the investigator.

A program of orientation for all members of the nursing personnel who participated in the study was carefully planned so that sufficient time was available for clarification before beginning the study.

Data were collected daily and transferred to master tally sheets maintained by the investigator. These data were coded so that age, sex, and diagnosis were easily differentiated. Data were analyzed statistically utilizing the t-test and Chi Square. Medications and treatments were tabulated daily according to numbers and kinds. The amount of time necessary to meet needs, administer medications, perform treatments, prepare for and chart same, was established. Criteria were developed by the investigator and were reviewed by a panel of experts. Duties were allocated according to criteria.

The results of the study indicated that patients have needs in all areas including physiological, therapeutic, psychological, sociological, spiritual, and basic individual needs as well as the need for physical care. It was further

found that needs varied with different patients both in the special hospital for cancer and in the two general hospitals. Furthermore, regardless of diagnosis needs differ significantly according to sex with the needs of the female patients being greater in all areas. Needs also differ significantly according to diagnosis with cancer patients having greater needs in all areas than non-cancer patients. However, there is no apparent difference in the variety of needs exhibited by patients according to either sex or diagnosis. Time in addition to that required for physical and personal hygienic care must be allocated if total nursing needs of patients are to be met. Finally, constant awareness of these needs with continuous evaluation and re-evaluation will be essential to meet needs as they vary from day to day.

The proposed staffing pattern will not be the same for every hospital. The method utilized for this study can be duplicated elsewhere, and will be effective as a basis for determining the kind and amount of nursing personnel necessary to meet total nursing needs.

Microfilm \$3.30; Xerox \$11.50. 255 pages.

CHANGE IN ATTITUDES OF BASIC NURSING
STUDENTS: AN INVESTIGATION OF SELECTED
ATTITUDES OF STUDENTS ENROLLED IN
BASIC NURSE EDUCATION PROGRAMS
AT BEGINNING AND AT END OF
ONE ACADEMIC YEAR OF STUDY.

(L. C. Card No. Mic 60-1083)

Beatrice Ruth Brooks, Ed.D.
New York University, 1959

A study has been made attempting to determine which factors influence certain attitudes of nurses. A determination of Authoritarianism, Humanitarianism, and Stereotypes was made for a selected group of freshman students enrolled in Diploma, Associate Degree, and Baccalaureate basic nurse education programs at entrance and after completion of the academic year. Other independent variables considered were Intelligence, Socio-economic status, Social Dominance-Submission and Adjustment. The data show to what extent changes of attitude may be attributed to one academic year of the Program, as modified by the other variables.

The following hypotheses were tested. First: a difference in attitudes exists between samples at entrance. Second: the net change in attitude after a year would be different in accordance with program type. Third: there would be consistency of attitudes within a program sample, but not between them.

Of the 833 subjects obtained on the basis of delimitations set for age, marital status, sex and lack of previous education in a school of nursing, 614 were enrolled in thirteen Diploma schools, 45 in five Associate Degree schools, and 174 in six Basic Baccalaureate schools.

Scales utilized for testing variables were obtained from the literature and said to be highly valid and reliable. Attitudes were measured by semi-indirect objective scales of single form: F-scale for Authoritarianism, Eron's Humanitarianism scale and the "Scale of Beliefs" for Stereotypes. Scales for independent variables were:

Wonderlic Personnel test for Intelligence; 'Occupation of Father' sub-scale of Warner, et al., Index of Status Characteristics for Socio-economic background; Maslow's Social Personality Inventory for Social Dominance-Submission; and Bill's 'Index of Adjustment and Values' for Adjustment.

Independent variables were measured once at initial testing and also personal data was obtained then. Attitudes were measured at both initial and retest periods. Significance was accepted at the five per cent probability level.

The results of the testing showed: the first hypothesis was considered untenable for Authoritarianism and Stereotypes and tenable for Humanitarianism, with the Associate Degree sample the lowest and significantly different from both Diploma and Baccalaureate samples.

The second hypothesis was considered untenable for Humanitarianism; and tenable for Authoritarianism, with the Associate Degree sample the lowest and significantly different from the other samples. There was a significant difference between all samples on Stereotypes.

The hypothesis of consistency within a program group has been substantiated for every sample. The mean amount of change between samples indicated significant differences for Authoritarianism and Stereotypes but not for Humanitarianism. The mean difference between pre and post scores in each attitude was compared with background classifications of Intelligence, Socio-economic status, Social Dominance-Submission, and Adjustment. A high positive relationship between change of attitude and background was not noted except once in the Associate Degree sample. Apparently experience in the program alone consistently influenced changes in attitudes.

A trend is noted in which there is a general decrease in Authoritarianism and Humanitarianism, and an increase in Non-Stereotype attitudes as a result of a year of study. The Associate Degree sample has shown the greatest movement toward the desired trend in the attitudes of Authoritarianism and Stereotypes.

In summary, it has been demonstrated that experience in a program does effect change in the attitude. This change is in most instances unrelated to the sub-classifications. In one instance, in the Associate Degree sample, change in Authoritarianism was markedly related to Social Dominance-Submission. It would appear that other factors such as maturation, social, clinical and theoretical experiences, etc., which have not been considered may be operating. Suggestions are made for further experimentation using the basic design of the present study with suitable modifications.

Microfilm \$3.20; Xerox \$11.05. 245 pages.

HEALTH SCIENCES, PATHOLOGY

EXPERIMENTAL PORCINE LEPTOSPIROSIS

(L. C. Card No. Mic 60-914)

John Jefferson Clark, Ph.D.
University of Minnesota, 1959

Major Professor: Jay H. Sautter

These studies were initiated to broaden the existing serological, clinical and pathological knowledge of *Leptospira icterohaemorrhagiae* infection in swine.

The findings of experimental porcine *L. icterohaemorrhagiae* infection are similar to those findings observed in natural and experimental leptospirosis in animals.

A total of twenty-five (six controls) swine were used in three parts to study the serological, hematological, bacteriological, thermotactic, symptomalogical, and pathological aspects of the disease.

Virulent culture, infected guinea pig and hamster tissues were injected intraperitoneally into young porcine animals.

The noteworthy characteristics of the disease can be expressed in terms of averages. The disease is initiated by pyrexia 2.6 days after inoculation. The fever attains a height of 105.79°F. existing for a total 7-8 days. Symptoms of dyspnea, lethargy and anorexia appeared 3.63 days after inoculation and continued 4.5 days. Leukocytosis became evident in 3.8 days following inoculation, lasted 4 days with an average maximum numerical height of 22,287 cmm. This was followed 5.9 days from inoculation by leptospiremia which had a duration of 1.63 days. Icterus was apparent 6.5 days after inoculation and existed for 4.16 days (six swine only). The first appearance of an A-L titer (1:10) was 7.8 days; reaching a maximum point of 1:10,000 in 33.0 days, remaining at this level for 82.2 days with a total period of an A-L titer existing for 139.6 days.*

The macroscopic and microscopic lesions found in the swine necropsied on the fifth, sixth, and seventh post-inoculation days in Part III presented no significant differences and were as follows: mild interstitial and peribronchial pneumonitis, mild portal triaditis with an occasional eosinophil, interstitial nephritis, leptospiral infection of the kidney and mild interstitial pancreatitis.

The pulmonary and pancreatic lesions have not been described before as a prominent lesion of animal leptospirosis and have not been reported in this porcine disease previously.

Microfilm \$2.50; Xerox \$6.40. 134 pages.

*Approximate number of days.

HEALTH SCIENCES, PHARMACY

EFFECTS OF GIBBERELIC ACID
ON *MENTHA PIPERITA*

(L. C. Card No. Mic 59-6533)

Charles Dwayne Ogzewalla, Ph.D.
University of Utah, 1959

Chairman: L. David Hiner

The purpose of this investigation was to determine if the application of gibberellic acid would effect the production of peppermint herb and peppermint oil, and if the resulting products would meet U.S.P. specifications.

Peppermint plants grown in a garden in Centerville, Utah, were sprayed weekly with 0, 10, and 100 ppm gibberellic acid. Collections of peppermint herb were made of the field-grown plants during the summer and fall of 1958 and during the summer of 1959. Volatile oil was distilled from the fresh herb. Observations were made of the histological and morphological changes in the peppermint plants and the volatile oil obtained therefrom was assayed for the physical and chemical properties specified by the U.S.P. the data obtained appear to justify the following conclusions:

1. The morphological changes observed were characterized primarily by stem elongation and to a lesser degree by changes in leaf shape. The latter changes were related to the position of the leaf on the stem; the lower leaves were similar in shape but larger in surface area than leaves of control plants, whereas the higher leaves were more lanceolate and smaller in area.

2. The fresh weight yield of peppermint herb was reduced significantly but the dry weight yield of peppermint was not significantly different from that of the control plants.

3. Following harvest of the herb of treated peppermint plants, a new crop of peppermint was allowed to grow without further treatment. The second crop from GA-treated peppermint plants was markedly smaller than the crop from the control plants.

4. The yield of oil was reduced when compared on both a fresh weight and dry weight basis.

5. A single spraying of GA produced stem and internode elongation which was followed by a reduction in the rate of stem elongation and in the length of the internodes being produced. In some stems this reduction in elongation was accompanied by loss of apical dominance.

6. From observations of histological sections of the stem it was concluded that cell elongation primarily accounts for the change in internode length. There was no significant increase in the number of cells in the longitudinal direction.

7. In the stem cross section, a decreased number of cells in all tissues was observed. The reduction of cells resulted in a thinner stem.

8. Leaf cross sections revealed that the leaves were thinner than the leaves of the control plants. Changes in the shape of the cells were observed.

9. The powdered herb obtained from plants treated with GA was indistinguishable from the powdered herb of control plants or from powdered U.S.P. peppermint.

10. Assays were run on the oils obtained from the treated peppermint plants for the physical and chemical

properties specified by the U.S.P. under peppermint oil. In general, the oils from plants treated with GA had higher specific gravities than the oils from control plants, were more levo-rotatory, had higher refractive indices, and contained larger percentages of esters calculated as menthyl acetate and of alcohol calculated as menthol. Only one oil produced was within U.S.P. specifications and that was from a plant sprayed with 10 ppm of GA and harvested in the summer of 1959.

11. From the observations made to date, no recommendation can be made for the use of GA on peppermint crops. Further studies should be run to evaluate the effects of other concentrations than those used and other methods of application. Because the control peppermint plants grown in Utah did not yield U.S.P. grade oil, any further work done should be in an area of commercial peppermint production. It would appear, however, that 10 and 100 ppm GA as weekly sprays is either too high a concentration or is too frequent a spraying schedule for optimum production of peppermint herb or peppermint oil.

Microfilm \$2.50; Xerox \$4.00. 71 pages.

HEALTH SCIENCES, PUBLIC HEALTH

STUDIES ON THE ROLE OF THE PROPERDIN
SYSTEM IN NATURAL IMMUNITY TO
CERTAIN ANIMAL PARASITES

(L. C. Card No. Mic 59-5558)

Vichazelhu Iralu, Ph.D.
The University of North Carolina, 1959

Supervisor: John E. Larsh, Jr.

This study was undertaken to determine whether or not the parasitocidal power of fresh normal sera of certain vertebrates is due to the newly described properdin system known to be active against certain bacteria and viruses.

The sera of both warm-blooded vertebrates (man, rabbit, cat, and duck) and cold-blooded vertebrates (snakes, frog, and turtle) were selected for study, along with representative groups of both metazoan and protozoan parasites. The metazoans were the cercariae of several trematode species, including two mammalian schistosomes, while the protozoa were two species of the genus *Trypanosoma*, one species of *Leishmania*, and two species of *Entamoeba*.

All of the sera tested showed cidal action against at least one of the parasites tested, suggesting that this innate property of vertebrate sera is widely distributed in nature. This parasitocidal action of the fresh sera was invariably destroyed by heating at 56 C for half an hour, indicating that either, or both, properdin or the thermolabile components of complement could be involved. Since the polysaccharide zymosan removed, or diminished, the cidal action of some of the sera, it showed that properdin, in particular, may be involved in this phenomenon. Conclusive proof of the essential role of properdin in the cidal action was shown in the removal of this property of fresh serum by neutralizing its properdin with antihuman

properdin serum. The role of magnesium in the properdin system was also verified. A highly cidal serum was made weakly cidal when its content of the divalent metals, magnesium and calcium, was reduced by using a cation exchange resin. The addition of magnesium to this deficient serum restored the cidal power to a high level.

On the basis of the results dealing with *Schistosoma mansoni*, *Trypanosoma duttoni*, *Leishmania donovani*,

Entamoeba histolytica, and *Entamoeba terrapinae*, it is clear that the parasitocidal power of the sera was due to the properdin system. This encourages the belief that this system may play a decisive role in the natural immunity of animals towards many animal parasites. Further lines of research that are desirable are pointed out.

Microfilm \$2.50; Xerox \$5.00. 98 pages.

HISTORY

HISTORY, MEDIEVAL

PROLEGOMENA TO THE ANGLO-SAXON CHARTERS

(L. C. Card No. Mic 60-1024)

Ronald Dean Ware, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Robert L. Reynolds

The Anglo-Saxon charters, chiefly royal diplomas, constitute one of the major sources for medieval Western European history. The documents, considerably over a thousand in all, stretch in an unbroken series from the seventh century to the Norman Conquest, and provide valuable and often unique information pertinent to most aspects of pre-Conquest English civilization. The majority of these charters has been edited in two large collections, John Kemble's *Codex Diplomaticus* (1839-48) and W. deG. Birch's *Cartularium Saxonicum* (1885-93), but neither edition is adequate by modern standards. The deficiencies of 'Kemble' and 'Birch' have inspired elaborate re-editions of all the Anglo-Saxon vernacular instruments, and have provoked repeated demands over the last half-century for a new and comprehensive edition of the Latin charters. Such a project, however, would necessitate the cooperative efforts of a variety of specialists over a period of some years; so it is not anticipated that such a formidable enterprise will be undertaken in the near future.

While we await this needed re-edition of the corpus of extant charters, an extremely useful tool would be a printed bibliographical guide to all the scattered special studies and notices relating to individual documents. The results of recent investigation, as well as some isolated re-editions of particular texts, are so inconveniently dispersed in local antiquarian journals, *Festschriften*, or the like, that they are known only to practised experts. Although nothing can be done to make this literature more accessible, it seems a sufficient benefit merely to advertise its existence. The gathering of the data for such a guide is still in progress by the author; meanwhile this present study offers a general introduction to the more significant published resources of the field, and to some of the techniques and criteria of charter criticism. In addition to a diplomatic analysis of the charter and its constituent elements and a comparison with cognate con-

tinental diplomata, several special problems are touched upon, although in no definitive fashion: the origin and evolution of the charter form in England, the question of an Old English Chancery, and the characteristics of charter language and formulae. With the exception of a few original suggestions *passim*, the value of this survey is principally in its syntheses of the argumentation and conclusions of a rather extensive body of scholarly literature.

Relatively few charter texts have survived to the present in original or near-contemporary form, and facsimiles of these are available for the exercise of palaeographic controls. Most texts, however, come to us in the form of medieval copies preserved in several dozen monastic cartularies. The problem of discriminating genuine from spurious charters is intimately involved with an understanding of the date and peculiar circumstances of each cartulary's compilation. For the information of the non-specialist, then, these several sources for Anglo-Saxon charters are described, with special attention to the date of writing and general reputation of the manuscript. It is hoped that a knowledge of the diverse character and value of these manuscript sources will promote greater appreciation of the individuality of separate texts, and will prevent the charters from being foolishly employed as a collectivized and uniform authority.

Microfilm \$2.50; Xerox \$7.00. 148 pages.

HISTORY, MODERN

CHINESE LABOR IN CALIFORNIA 1850-1880, AN ECONOMIC STUDY.

(L. C. Card No. Mic 60-985)

Ping Chiu, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Vernon Carstensen

This is a study of Chinese labor within the framework of the general economic development of California. Chapter one presents a brief survey of the characteristics of early California's economy, and chapter four deals with

California's changing economic structure 1865-1880. In the main body of this study, Chinese labor in mining, agriculture, and woolen textile, shoe, cigar, and clothing manufacturing are examined in detail. The last chapter contains a summary and an appraisal of the views and opinions on the effects of Chinese labor on California's economy.

From 1850 to 1864 the Chinese in California were mostly "independent" miners; Chinese wage laborers were a rarity. In the fifties, anti-Chinese riots were intricately tied up with the revolt of the "independent" miners against the encroachment and the ascendancy of the mining companies, and their losing of the status of an independent producer.

As the mining, water, and canal company boom terminated in the late fifties, capital sought new investment outlets in agriculture, construction works (railroad, reclamation, and irrigation), and manufacturing. In these fields the majority of the Chinese were employed, after the surface mines gave out in the mid-sixties.

Spotty recessions hit California in eighteen sixty-seven, sixty-nine, and in the early seventies, and a general depression began in eighteen seventy-six. The depression formed the basis of a united front between the small manufacturers and the workers, and transformed anti-Chinese riots into a moving political force.

However, the survival of the sweatshops in California was not threatened by the competition of the Chinese firms in San Francisco, but that of Eastern factory-made goods in the local market. With few exceptions, during the second half of the eighteen seventies, white and Chinese labor constituted essentially non-competing groups. Therefore, there was no necessary connection between the expulsion of the Chinese and the profitability of the sweatshops or the employment possibilities of the white workers. Nevertheless, whenever the validity of the cherished dream of unlimited self-improvement seemed tenuous and needed reassurance in California during this period, the presence of the Chinese offered a ready explanation for the gap between the ideal and the actuality. It might not have been an intelligent or a valid explanation, but it satisfied deep emotional requirements and vouched for the adequacy of the American dream.

Microfilm \$3.85; Xerox \$13.50. 299 pages.

THE HESSIAN ANABAPTISTS: BACKGROUND AND DEVELOPMENT TO 1540.

(L. C. Card No. Mic 60-819)

Allen Wendell Dirrim, Ph.D.
Indiana University, 1959

Until recently historiography of Anabaptism, the most conspicuous part of the "radical Reformation," has relied largely on either confessionally biased contemporary sources or on accounts by modern socialists. With the discovery and partial publication of original Anabaptist sources, a revisionary school led by Mennonite scholars has defined Anabaptism in rather narrow theological terms. This study is an attempt to clarify divergent interpretations and definitions of the Anabaptists within the manageable framework of a single territory, Hesse,

where they made notable progress during the first decades of their existence under the relatively tolerant policy of Landgrave Philip.

Though usually oriented around a literal interpretation of Scripture and the religious desire to reconstruct an apostolic church of believers, Hessian Anabaptism exhibited diverse manifestations which furnish evidence for radically conflicting interpretations if any one period or aspect is settled upon as characteristic of the whole. Although spiritualism, mysticism, and other theological tendencies appeared in Hesse, the tendency most critical for the sect's fate and the most controversial in interpretation was its attraction for latent discontent.

Growing absolutism, economic difficulties, a rigid stratification of society, and intense religious conflicts produced tensions which erupted in several different channels before and during the Peasants' Revolt of 1525. Cast off by the reformers, the discontented elements of the lower classes had received no concessions before Swiss Anabaptism, modified by the addition of eschatological and spiritualistic elements, reached Hesse. Initially Anabaptism attracted both the revolutionary and reform elements of 1525, but except for certain spiritualistic religious remnants, the politically revolutionary party quickly died out. By its secular implications, more moderate Anabaptism, which gradually supplanted the eschatological phase, continued to attract former supporters of the Twelve Articles. In so far as Hesse is concerned, revisionist interpreters of the Anabaptist movement, probably as a result of improper evaluation of the objectives and methods of the more moderate townsmen and peasants, have gone too far in dissociating Anabaptism from the revolt of 1525. Socialist accounts, on the other hand, have misconstrued the basic religious motivation of both the moderates of 1525 and the Anabaptists.

In the 1530's the center of Hessian Anabaptism shifted away from its connections with the revolt, and new leaders moderated the doctrine still further. After the Münster rising they curtailed its attraction to discontent, but they were still critical of the political, economic, and social *status quo*, and they failed to win the privileged classes. The periods of greatest Anabaptist success appear to have coincided with periods of economic distress.

The landgrave's treatment of the Anabaptists reflected his conviction that their faith was genuine but misguided. With the help of Martin Butzer, he was able to convert the major leaders in 1538 by theological argument and ecclesiastical concessions. Butzer's success crippled the movement by removing its only native educated leaders. Kept alive in part by the incomplete nature of the reforms and concessions, the remnant which was left drew its inspiration primarily from Moravia for the rest of the century. Microfilm \$3.20; Xerox \$11.05. 245 pages.

THE LIMITS OF AGRARIAN REFORM IN THE SLAVE SOUTH

(L. C. Card No. Mic 60-1139)

Eugene D. Genovese, Ph.D.
Columbia University, 1959

Supervisor: Dumas Malone

During the first half of the nineteenth century the wasteful and destructive methods of cultivation that had arisen under frontier conditions were gradually replaced by conscientious attempts at soil restoration, crop diversification and rotation, and livestock improvement. The South shared in this improvement only partially, for slavery engendered a low level of productivity and related evils that together made a general reform impossible.

Among the less direct effects of slavery were the retardation of capital accumulation and of the formation of a home market. The rapid concentration of land, slaves, and wealth prevented the development of a large rural home market and therefore held back urban manufactures. In turn, the lack of an urban market, together with the lack of capital, rendered impossible a thorough agricultural reform.

The greatest weakness of the slave economy was the low productivity of labor, which had its most direct expression in the slaves' careless and wasteful work habits. Less directly, low productivity imposed severe limitations on technological development and the division of labor. The argument of some leading scholars (U. B. Phillips, L. C. Gray, A. O. Craven) that low productivity is to be accounted for by the cultural backwardness of the Negro rather than by his slave status cannot stand the test of anthropological investigation. The Negro came from agricultural communities in Africa and was accustomed to hard work. Only a generation, at best, was needed to broaden his skills. Although the slave may have worked well enough in the cotton fields under the gang system, he was not to be trusted, except under special conditions, under a more advanced system of division of labor. Statistics on home manufactures and the employment of skilled labor, culled from the manuscript census returns and from plantation manuscripts, show that division of labor was minimal. Under the circumstances concentration on a staple crop, even in periods of low prices, had to be more profitable than the diversion of labor to other activities.

Slavery and the plantation system led to agricultural methods that depleted the soil. In this respect the experience of the South did not differ much from that of the North; but slavery forced the South into continued dependence upon exploitative methods after the frontier had passed. The plantations were too large to fertilize easily; the necessary livestock was missing; the planters and farmers could not afford commercial fertilizers; proper rotation could be practiced only with great difficulty; and the labor force, upon which every attempt at reform depended, was of poor quality.

The pleas of the reformers for diversification and improvement of livestock were little more than exhortations for a step backward toward natural economy. While slavery existed, the regional market for foodstuffs remained small, and progress had to be limited to supplying the needs of the plantation itself. With greater effort and

support the reformers might have made the South self-sufficient in food, but the one-crop system, with its destructive effects on the soil and the general economy, would have been modified only slightly. The program of the reformers could not have resolved the dilemma of how to retain slavery and yet guarantee the preservation of Southern productive and political power.

A more genuine reform did take place in certain areas: Maryland, Virginia, and some counties of the Lower Southeast. Elsewhere, notwithstanding great claims, reform proceeded with great difficulty. The reform process in the older areas of the South contained grave contradictions. First, reform depended upon the sale of surplus slaves to raise the capital necessary for improvements and to reduce the slave force to a size permitting careful supervision and division of labor. Past a certain point, the economy had to follow the course of Maryland toward the gradual abolition of slavery and institution of free labor or face the resurgence of the old difficulties. Secondly, the regular sale of slaves threatened to corrode the pride in slaveholding that was so essential to the maintenance of the ideological defense of slavery. Thirdly--and most important--the slave sales were made possible by the continued use of gang-labor methods in the Lower South. Even with reform, statistical analysis suggests that agriculture was about marginal and that profits came from slave-raising. When the newer areas also were forced to reform, the markets for surplus slaves would dry up. Reform in one area depended upon the maintenance of old methods in other areas. A general reformation of agriculture was impossible so long as slavery was retained.

Microfilm \$3.20; Xerox \$11.25. 247 pages.

THE EVOLUTION OF ALLIED MILITARY GOVERNMENT POLICY IN ITALY

(L. C. Card No. Mic 60-1143)

Joseph Albert Hearst, Jr., Ph.D.
Columbia University, 1959

This study is devoted to an evaluation of Allied Occupation policy in Italy. It covers the period from February, 1943, to February, 1944. Planning for military government started during the first month mentioned and continued until after the actual invasion on July 10, 1943. On February 11, 1944, the Allied Control Commission assumed authority for the government of occupied Italy and replaced the Allied Military Government. In this period of a year, policies and practices were developed which set the basic pattern for subsequent occupations by both the British and American armies. The planning and evolution of these policies furnished the *raison d'être* of this dissertation.

The first chapter is devoted to a delineation of the role of military government and the relationship between doctrine and policy. The second emphasizes the political and military climate in which decisions were made. The third traces the chronology of the planning period. The following chapters show the pattern which emerged from the occupation and evaluate policy as it was developed to meet crisis problems.

Three major problems of fundamental concern to military government emerge from this evaluation. The first, an almost self-evident point, is the importance of plans which are carefully made, timely, and relatively complete. Insofar as military government was concerned, the planning process was not yet completely understood at the time of the Italian invasion. When this lack of understanding was combined with a fairly general ignorance of the role of military government among professional military personnel, Allied Military Government found itself dealing immediately with an organizational and doctrinal crisis of some dimensions. This, in turn, furnishes an explanation of why certain mistakes occurred and certain decisions, little understood at the time, were made.

The second major point is more difficult to define and remains an area worth detailed and trenchant inquiry. This is the relation between doctrine and policy. A combination of ideological predisposition and military doctrine met in a process which was partially dialectic and partially parallel to influence policy formulation very strongly. However, although this influence can be seen in comments of participants, it proved practicably impossible to interview enough of the participants to arrive at any sound judgments concerning the relative importance of such an interplay. Additionally, current situational problems affected judgments in time and the participants' recollection frequently proved faulty. As a result, only speculation and supposition can identify and delineate its role.

The last and most important of the major points studied as a problem here was determination of the actual levels where policy decisions were made. Although it was not surprising to discover that the "heads" of governments rarely made the important decisions and, in fact, did little more than suggest general guide lines to the organizations concerned, it was surprising to discover that the chief architects of Allied policy in the theater of operations were relatively minor officers. The role played by these individuals was not recognized either in the planning process or in the actual operation. However, a study of the records of the occupation indicates that in concern over local crisis situations two men, Lieutenant Colonel Charles Poletti and Lieutenant Colonel Charles A. Spoford, laid down most of the important policies subsequently adopted by the Allies.

The general conclusion reached by the writer is that military government succeeded only because the Italian people welcomed it and the Allied personnel who worked in the field were to a great extent devoted and self-sacrificing. The study suggests that the role of military government, the personnel needs of the field, and an adequate understanding of the importance of planning for occupation will have to be recognized as imperative if future occupations are to succeed.

Microfilm \$4.25; Xerox \$14.85. 329 pages.

**J. ALLEN SMITH AND THE
PROGRESSIVE MOVEMENT: A STUDY
IN INTELLECTUAL HISTORY.**

(L. C. Card No. Mic 60-861)

Thomas Coshaw McClintock, Ph.D.
University of Washington, 1959

Chairman: Thomas J. Pressly

This is a biography of J. Allen Smith, Jeffersonian Democrat and "insurgent scholar". Because of the extent to which he typified the academic reformer and because his views are most meaningful when related to those of his contemporaries, this is an intellectual history of the Progressive Period as well.

Smith was born in May, 1860, near Pleasant Hill, Missouri. His parents had come to Missouri from Virginia and during the Civil War were loyal supporters of the Confederacy. Shortly after the war, his family settled on a farm on the edge of Kansas City. Here, in the Valley of Democracy with its faith in Jeffersonian political idealism and individualism, he grew to manhood. However, this also was the Middle Border, and Smith and his family experienced first-hand the economic hardships which produced the agrarian protest and reform movements in the 1870's and 1880's. After graduating from high school, he taught in a country school near Kansas City until 1883 when he entered the University of Missouri. He received his B.A. in 1886 and his LL.B. the following year. He then returned to Kansas City and practiced law for five years. Becoming dissatisfied with the legal profession and growing increasingly interested in the monetary question and other economic and political problems and reform movements, he abandoned his law practice in 1892 and began working for a Ph.D. in political economy at the University of Michigan under Henry Carter Adams, a leading spokesman of the "New Economics". For his dissertation he wrote on the monetary question, proposing a "multiple money standard" as an alternative to both the gold and bimetallic standards. He received his Ph.D. in 1895 and the following year was appointed professor of economics and sociology at Marietta College in Marietta, Ohio. However, because of his opposition to the gold standard and his criticism of the trusts, he was dismissed by the Marietta trustees in 1897. Shortly afterwards he was appointed professor of political economy at the University of Washington and he would remain at that institution until his death in January, 1924.

With the exception of his dissertation, all of Smith's published writings appeared while he was at the University of Washington. He was not a prolific writer, his significant writings included two books plus a few articles on municipal reform. His first book, *The Spirit of American Government*, for which he is largely remembered today, was published in 1907. In this book he attacked the Constitution and the government which it established as undemocratic. Appearing just as the progressive movement was approaching "flood tide", the book exerted considerable influence on economic and political reformers and on a small but influential group of social scientists. In his articles on municipal reform, he was primarily interested in public ownership of municipal utilities and home rule, both of which he favored, and state utility commissions, to which he was opposed. His

second book, The Growth and Decadence of Constitutional Government, was published posthumously in 1930. This book, which had been inspired by events during and after the First World War, was primarily an attack on growing economic and political centralization and on internationalism. In contrast to The Spirit, The Growth received little notice at the time it was published or since.

In addition to his importance as an example of the Jeffersonian reformer and "insurgent scholar" in the Progressive Period and his contribution to the study of political institutions and practices, Smith was a great teacher and a number of his students went on to distinguished careers as educators, writers and public servants.

Microfilm \$7.65; Xerox \$27.25. 601 pages.

THE SOUTHERN WING OF THE KU KLUX KLAN IN AMERICAN POLITICS, 1915-1928.

(L. C. Card No. Mic 60-836)

Arnold Sanford Rice, Ph.D.
Indiana University, 1959

The Ku Klux Klan of the 1920's was a many-faceted organization, subscribing to a half dozen or so tenets. To carry out its program the secret order used a variety of methods, one of which was engaging in political activity. To be sure, Klanism was nationwide, but historically, traditionally, spiritually the order was a southern phenomenon. For this reason the story of the Klan in American politics has been limited to its southern wing.

The period from 1915 to 1928 is treated. The former date marks the beginning of the secret order patterned after the Klan of Reconstruction days. The terminal date, 1928, was chosen, since in that year the fraternity expended what energy it had left in an all-out political operation.

The progress of research was hampered by the Klan's taking refuge in secrecy and having at the height of its career fallen into disrepute with the American public. Because the organization was discredited, the personal papers of ex-Klansmen were either destroyed or are being kept well hidden by these former members of their survivors. It is, therefore, not difficult to understand why the primary sources of Klan origin used in the writing of this study consist solely of the order's printed magazines, newspapers, and pamphlets. Leading American newspapers, particularly of the South, and reports of two congressional investigating committees were relied on to a large extent.

The political influence of the Klan was far greater than its numerical strength would indicate. The order developed into a conspicuous and most energetic leader of the many millions who adhered to a brand of politics derived from chauvinism and religio-racial antipathies.

The chances were that not long after a local Klan in the South had been organized it would be participating in the political affairs of its community. The chapter would make special drives to procure as members local public officials. Also, if the chapter were strong enough to exercise the balance of power in elections, it would place in office candidates who were Klansmen or pro-Klansmen. Success in both these endeavors meant that the chapter

was able to obtain local legislation favoring its program and to secure its activities from legal interference.

The deeper in the South the Klan existed, the more important it became in state politics, having three "pockets" of especial strength in Georgia, Alabama, and Texas.

The national political activity of the southern wing of the order reached its height in the 1924 Democratic convention and in the 1928 presidential campaign. The Democratic national convention of 1924 was the scene of the grossest sort of antipathy and factiousness. A new political issue--the Klan--widened the historic gulf between the southern and eastern wings of the party, since the South was the "home" of the Klan and the East the center of anti-Klanism. If the Klan was indeed a factor in the desertion of almost half the "Solid South" to the Republican candidate in the presidential election of 1928, then it was not the Klan organized political potency of former years, but the Klan spirit that made it so.

As a result of its activity in the political field the Klan suffered three significant effects: it aroused the wrath of the American public; it became dependent on whatever political skill its members happened to possess; and it dissipated its energies in activities so diverse that it lost its effectiveness.

Microfilm \$2.70; Xerox \$9.25. 205 pages.

STALIN AND THE FRENCH COMMUNIST PARTY, 1941-1947.

(L. C. Card No. Mic 60-1160)

Alfred J. Rieber, Ph.D.
Columbia University, 1959

The German invasion of the Soviet Union in June 1941 led to an abrupt tactical shift in Soviet foreign policy and in the policies of the French Communist Party. The Soviet and the French Communist leaders adopted a program of "unity of action" aimed at complete mobilization of all forces against Hitler while also safeguarding their freedom at a later stage to pursue goals at the expense of their provisional allies. In putting this policy into effect, Stalin and the French Communists maintained an ambivalent attitude toward General De Gaulle. They gave him limited support to help fight the invader, but at the same time they sought to strengthen their own positions so as eventually to deal with him on their own terms. The Soviet and French Communist leaders sought constantly to persuade De Gaulle to adopt a pro-Soviet foreign policy, and at the same time the French Communists prepared positions of power in the French Resistance Movement and advocated a program which, if adopted, would alter profoundly the postwar structure of France.

Moscow and the local Communists were unable to bring direct pressure on De Gaulle as they could on the leaders of the East European governments-in-exile because the Red Army was not standing on French soil and the French Communists were unable to drive the Germans out of France by their own efforts. The presence of American and British troops in France after the landings in June 1944 and the needs of a joint campaign against Nazi Germany obliged the French Communists to give up any

plans for retaining their para-military forces for an eventual seizure of power. The party then concentrated on building up its power and prestige mainly through legal and parliamentary action. Because it sought to forestall any increase in American or British influence in France and, above all, to prevent the formation of a West European bloc, the party worked to rebuild France as rapidly as possible so as to reduce its dependence on American aid and increase its contribution to the war effort. Similarly Stalin negotiated with De Gaulle in November 1944 in order to win French support of Soviet policies in Poland and to woo France from the Western Allies. At the same time the Soviet Union and the French Communists stepped up their criticism of De Gaulle and other liberal-democratic elements in France and finally demanded the creation of a "popular democracy."

The failure of the French Communists to win power in 1946 and the inability of the Soviet Union to make any further gains at the expense of the Western allies checked Soviet expansion and led to a revival of Soviet and French Communist denunciations of the "capitalist West." The policy of "unity of action" was ultimately shattered by the Soviet position on the German problem. The French Communist cabinet ministers refused to endorse their government's views on Germany, which ran contrary to Soviet policy. However, in order to avoid a show-down over a foreign policy issue, the party seized upon a domestic crisis, the Renault strike in April 1947, to challenge the democratic forces. Their gamble failed and the Communists were forced out of the government. The party struggled to reenter the government on its terms, but the Soviet rejection of the Marshall Plan doomed it to aimless drifting until in October 1947 the Soviet leaders publicly berated the party for its out-dated tactics. True to their primary allegiance, the French Communists adopted the Soviet-inspired shift from the policy of "unity of action" to the new line of "open struggle against the imperialist threat."

Microfilm \$5.95; Xerox \$21.20. 467 pages.

THE NATIONAL HEALTH SERVICE ACT, 1946.

(L. C. Card No. Mic 60-837)

Mary Elisabeth Seldon, Ph.D.
Indiana University, 1959

Although recurring epidemics of cholera forced the British Government to pass the Public Health Act, 1848, and successive Acts for improving the living conditions of England, these were often indifferently carried out. Not till about 1900 did the Government turn to regulation of personal as well as environmental health. Lloyd George's National Insurance Act, 1911, offered doctor's service, medicine, and a sickness benefit to all manual (and low-paid non-manual) workers, but did not cover hospitalization nor protect the workers' dependents. Its administration, originally determined by political expediency, was wasteful, overlapping, and unfair. The deficiencies of the health insurance were criticized, and curatives suggested, by a succession of Government, medical, and private commissions; but aside from patchwork changes, no real improvement resulted until the shock of the Second World

War forced radical reorganization in the interests of efficiency and awakened the popular appetite for a really effective health service.

The Beveridge Report (1942), proposing an integrated and rational system of social benefits, whetted this appetite. Accordingly, the war-time Coalition Government brought forward a health insurance plan in 1944 which offered to all people all necessary forms of medical care, but gave more power to the local government authorities than the doctors approved, and left untouched England's dual, voluntary and public, hospital system.

1945 brought Labour's election victory; and Bevan, Minister of Health, brought forward in 1946 the National Health Service Bill, offering a comprehensive health service free to all, based chiefly on taxation. Headed by the Minister, the administration would bring all hospitals under special Regional Boards, general practitioners under Executive Councils, and environmental health services under the local authorities, the latter receiving less power, and the medical profession correspondingly more, than under the 1944 plan. Vehement opposition arose to the transfer of voluntary hospitals to the Government. But this soon paled before the bitter resistance of the British Medical Association to aspects of the bill which seemed to suggest that the Government proposed an ultimate State-salaried service for doctors, an intention which the Government denied. The points of contention were a proposal to pay doctors a small basic salary, to abolish sale of practices, to bar new doctors from over-supplied areas, and to appeal doctors' cases to the Minister. Two plebiscites of the profession backed the British Medical Association against the Government and persuaded Bevan to forego the basic salary for doctors and amend the National Health Service Act to prevent a salaried service in future without special Parliamentary legislation. A third plebiscite, intended to force further concessions from Bevan, proved disappointing; and the profession agreed now to implement the Act, which became effective July 5, 1948.

Valid criticisms of the health service include over-working of the doctors; some but not excessive malingering; insufficient hospital beds for long-term cases especially; a tendency of doctors to specialize and of patients to resort to specialists, at the expense of general practice; insufficient liaison between parts of the service, as between doctors and hospitals; and the unexpectedly high cost of the service.

Microfilm \$4.75; Xerox \$16.65. 369 pages.

THE ONSLAUGHT OF RESPECTABILITY--A STUDY OF ENGLISH MORAL THOUGHT DURING THE FRENCH REVOLUTION 1789-1802.

(L. C. Card No. Mic 60-1020)

Richard Allen Soloway, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor George L. Mosse

The purpose of this dissertation is to describe and analyze changing views of morality and respectability held by a large segment of the English upper classes during the

period of the French Revolution from 1789 to 1802. It is the author's contention that the Revolution had a profound impact on such views. Although there was concern with upper class morals throughout the eighteenth century, the latter decades of that era reveal a marked increase in demands for moral reform. Once the monarchy was overthrown in France, many members of English society feared a similar political and social upheaval in their own nation. The solution for a large proportion of these people was a more austere and rigid code of respectable behavior.

The dissertation is primarily a definition and analysis of the code that emerged in relation to the French Revolution. In its wider conceptual framework the problem is discussed in terms of reform ideas as a whole. It is pointed out that although the Revolution proved to be a blow to social and political reform in England, it had just the opposite effect on morals and manners. It tended to promote reform. The author has also attempted to show how the moral code that emerged in the late eighteenth century was a forerunner to the concepts of respectable behavior held by Victorian society in the nineteenth century. It is important to remember that the parents and grandparents of the Victorian generations very often assumed their social attitudes and opinions during the years of war and revolution. These factors are also considered in terms of social mobility and the class structure of the period.

In order to obtain a wide sampling of popular thought on the problem of morality and respectability the author has utilized private letters, diaries, memoirs and journals of a great many persons in fashionable society. In addition much use has been made of the major magazines and journals of the time, for they are a rich source of popular thought. Pamphlet literature, books, essays and articles read or written by members of the upper classes have also been examined. In order to understand the attitude and influence of the church on the problem, the author has also studied and analyzed the diaries, letters, memoirs and sermons of many clergymen, both eminent and some virtually unknown. In general only ministers of the Establishment have been considered as the Anglican Church was essentially the church for the bulk of the upper classes.

Microfilm \$4.65; Xerox \$16.45. 362 pages.

THE LIFE AND TIMES OF BENJAMIN LOGAN

(L. C. Card No. Mic 60-710)

Charles Gano Talbert, Ph.D.
University of Kentucky, 1952

Benjamin Logan was born in the Shenandoah Valley about the year 1742. His parents, David and Jane Logan, had come from Ulster to Pennsylvania where they met and married. Benjamin grew to manhood in this region. In 1764 he participated in Colonel Henry Bouquet's expedition against the Indians.

In the fall of 1771 he visited the new settlements on the Holston River and decided to locate in that region. After selling his land on the Shenandoah the following spring, he purchased two tracts on the Holston. In the same year he married Ann Montgomery, who had come to the Holston with her parents in 1769.

Logan, who had served as a sergeant under Bouquet, soon became lieutenant of Captain William Cocke's militia company. By the fall of 1779, Logan, who had been one of the original militia captains of Kentucky County, was advanced to colonel. In May, 1781, Logan went to Richmond as a representative of Lincoln County in the Virginia Assembly.

After the turmoil of the Revolutionary War and the Indian trouble of the 1780's, Logan saw Kentucky move toward statehood. Ten conventions were held before Kentucky achieved statehood on June 1, 1792. Logan attended eight of these conventions as a delegate from Lincoln County. While the Fourth Convention was seeking a quorum in the fall of 1786, he led a successful expedition against the Shawnees in which thirty-two Indian prisoners were taken. Under Logan's supervision these were later exchanged for white prisoners held by the Indians.

With the establishment of the State of Kentucky two militia divisions were formed with Logan and Charles Scott commanding as major generals. By the end of 1783 Logan had resigned his commission and had offered to serve in a French legion, which, with George Rogers Clark as its leader, was being recruited in Kentucky.

Late in 1794 Logan announced in the *Kentucky Gazette* his desire to lead a voluntary campaign against the Chickamaugas. Before this plan could be executed, word came from William Blount, Governor of the Territory of the United States Southwest of the River Ohio, that these seceded Cherokees apparently had seen the error of their way and had offered to make peace.

After twenty years as a resident of Lincoln County, Logan, in 1795, moved his family to the County of Shelby. He may have believed that this would increase his chance of being elected governor of the state. The first governor, Isaac Shelby, was also a Lincoln County man. It was not likely that the electors would so honor the same county twice in succession. On the first ballot Logan ran ahead of his opponents, James Garrard, Thomas Todd, and John Brown, but fell short of a majority. Although the constitution made no provision for this situation, the electors decided that a majority should be required for election and proceeded to eliminate the names of Todd and Brown and to ballot again. This time Garrard ran ahead of Logan and was declared elected. Logan's request that the state senate, the legal arbiter of disputed elections, decide the question of who should be governor brought a decision from that body that the law which had placed such matters in its hands was unconstitutional.

By 1800 a new constitution was in effect in Kentucky, and the governor was to be elected by popular vote. Logan made the race again but ran behind James Garrard and Christopher Greenup, although ahead of Thomas Todd.

The sudden death of Benjamin Logan in 1802 removed from the Kentucky scene one of the most valuable of the state's pioneers. Although at his best as a woodsman and as a commander of militia, Logan held his own in the political field at a time when the state was controlled largely by men of more education than he had been able to obtain. His greatest contribution, however, had been his leadership of the militia in the struggle with the Indians. The members of the Kentucky General Assembly realized this when, on learning of his death, they rendered him tribute, not as a great leader in the legal, political, or constitutional realms, but as "the firm defender of his country."

Microfilm \$6.90; Xerox \$24.55. 543 pages.

THREE DECADES OF KENTUCKY POLITICS, 1870-1900.

(L. C. Card No. Mic 60-711)

Hambleton Tapp, Ph.D.
University of Kentucky, 1950

The purpose of the work has been to present a political history of Kentucky covering the period 1870-1900 between the end of readjustment following the Civil War and the turn of the century.

After a veritable nightmare of rough hewing, the two major political parties, Democratic and Republican, emerged in 1871 inured to combat and trimmed to certain definite policies. Pro-Confederate elements had gained control of the dominant Democratic party. This organization championed the South against the policies of the Republican controlled federal government. It had opposed the Fourteenth and Fifteenth amendments and stood against the progressive policies of the industrial North.

An aggressive minority of the Democratic party opposed the conservative trend. Led by Henry Watterson, this group favored acceptance of the amendments, better support for public education and strongly endorsed development of industrial resources. The old wing of the party was known as "Bourbon," the new was called "New Departure."

The Republican party in the state did not take definite form until 1871. It had suffered through post-war vicissitudes which had carried it all the way from Northern Radicalism to Union-Democratic conservatism, then back to moderation and liberalism. During the early 1870's it adopted, under the leadership of John Harlan, policies favoring industrial progress, educational advancement and political and social reform. These policies, the party advocated throughout the period treated in this study. The Republican, not the Democratic, therefore, was the progressive party through the period.

During the early 1880's, a short season of reform was ushered in under the Democratic leadership of the humanitarian governor, Dr. Luke P. Blackburn. Indications are that the Republicans, under the leadership of William O'Connell Bradley, aided Blackburn significantly in educating the people to a realization that reforms in property assessments, public education, eleemosynary institutions and the judicial system were a pressing necessity.

Economic distress during the period occasioned protest, resulting in "third" party movements. The Granger, Alliance and Populist movements are the outstanding examples. Voters left the dominant Democratic party, however, in no appreciable numbers until the late 1880's and 1890's, when the Populist party became a significant factor in Kentucky politics. Withdrawals from the major party enabled the Republicans to carry the state in 1895, 1896 and again in 1899.

Bitter dissension broke in the Democratic state convention of 1895. The "sound money," or gold standard men were able to control the platform committee and have a "sound money" plank adopted. The silver men, however, were able to nominate their candidate, P. Wat Hardin, for governor. General dissatisfaction prevailing, many of the "silver Democrats" went over to the Populist Party, which had nominated a full ticket.

The Republicans realized that the split in the Democracy was serious. They therefore nominated their strong-

est man, William O. Bradley, for governor and adopted a straight gold standard platform. Sufficient Democrats bolted the party to enable Bradley to win.

The acrimonious dissension in the Democratic party became violent in the legislatures convening during Bradley's administration.

In the state Democratic convention of 1896, the Silverites gained complete control of the party machinery and adopted a "cheap money" platform. Consequently, gold standard Democrats bolted and organized the National Democratic party in Kentucky, under the leadership of Henry Watterson, John G. Carlisle and Simon Bolivar Buckner. Although gaining few votes, the National party probably enabled the Republicans to carry the state for William McKinley.

Predominance of Silverites in the regular Democracy helped to bring to leadership J. C. S. Blackburn and William Goebel, both of whom were adept at arousing the poor farmer, the tenant and the laboring man against propertied interests. The seeds of strife and wrath sown by these leaders grew to full fruition in 1899, when the Republicans again won a state election. The bitter feeling fostered by Democratic factionalism prevented political reform, wrecked Bradley's administration and encouraged violence and lawlessness.

The dominant "cheap money" element of the Democratic party continued to court the "downtrodden" man -- the industrial laborer and the tenant farmer, while the Republicans espoused, with accelerated interest, the cause of the business man and property owner. Many of the substantial property-owning Democrats joined the ranks of the Republicans.

Widespread lawlessness and violence characterized life in Kentucky from the end of the Civil War to the turn of the century. This tendency became so excessive that the state gained a reputation universally for crime. The causes for that prevalent condition were both numerous and deep-seated.

The turn of the century found conditions in Kentucky far from tranquil.

Microfilm \$6.10; Xerox \$21.60. 478 pages.

PARTISAN POLITICS IN MASSACHUSETTS DURING GOVERNOR BERNARD'S ADMINISTRATION, 1760-1770.

(L. C. Card No. Mic 60-1022)

Leslie Joseph Thomas, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Merrill Jensen

Recent "revisionist" writing about Massachusetts politics in the pre-revolutionary decade denies that there was any "internal revolution" and asserts that there was unanimity of opinion in opposition to Great Britain on matters of imperial policy. In this thesis, the contemporary record is examined to test the validity of this "revisionist" interpretation in the light of the facts of political life during Governor Bernard's administration, 1760-1770.

It is the conclusion of this study, based upon extensive

examination of the sources, that there definitely was an "internal revolution" in the sense of a struggle for political power and control of the agencies of government on the provincial, county, and town levels throughout the period. This was the case because, by 1760, and throughout Governor Bernard's administration, most of the executive and judicial agencies of the provincial government were in the hands of a Hutchinson-Oliver family oligarchy that had entrenched itself in power by nepotism, plural office-holding, and control of patronage. Through its influence over the dispensation of patronage, either from the Crown directly or through the royal governor, this oligarchy's influence extended to the county level of government, where nepotism and plural office-holding were also extensively practiced. And the sheer magnitude of its power made its influence potent in town government as well. As a result, there was in fact an office-holding aristocracy, known as the "court" or government party, which with its wide circle of relatives, dependents, and friends constituted a formidable political party.

In opposition to this office-holding aristocracy were the professional politicians who were out of office and had no prospect of getting in, aligned with certain dissident economic interests, which were not sustained by the bread of patronage. This group constituted the nucleus of the "popular" party. Many in this party were possibly in opposition because of their objections to nepotism and plural office-holding as a matter of principle and out of concern for the public welfare. Many also professed concern about the threat to the constitutional rights of British subjects that existed with Crown "pensioners and place-men" holding policy-making positions that deprived the people of truly representative self-government. But constitutional principles and concern for the public welfare were not the only motives of partisanship. The factor of private resentment and antagonism of the "outs" toward the "ins," arising from frustrated ambition and personal pique, cannot be ignored in politics as a motive of partisan opposition.

Partisanship in domestic politics in Massachusetts, whether arising from constitutional principles or private resentments, had a tragic effect upon the colony's reaction to British imperial policies after 1763. British colonial policy from 1764 on had to operate in a political environment of partisan opposition that was conditioned to react according to certain patterns of behavior in domestic politics that had nothing inherently to do with the merits or demerits of any particular British policy. The office-holding aristocracy was necessarily the administrator and executor of British policies and as such, the popular party often seemed to be as much opposed to the individual administrators as to the policy. The net result was a tragedy for British colonial policies, which were continually a casualty of such personal-partisan opposition.

Microfilm \$11.15; Xerox \$39.65. 881 pages.

AMERICAN FOREIGN POLICY, REALISTS VS. IDEALISTS: A CATHOLIC INTERPRETATION OF THE GREAT DEBATE.

(L. C. Card No. Mic 60-356)

Sister Dorothy Jane Van Hoogstrate, S.L., Ph.D.
St. Louis University, 1959

The Great Debate in American foreign policy between the Realists and Idealists is pursued with renewed intensity today, but the issue is as old as the United States itself. The controversialists raise questions like these: Is national self-interest to be pursued irrespective of the welfare of other countries? Are nations bound by the moral law to meet the demands of justice and charity in the international community? Can one really understand more than the national good? Is power the primary element in politics? May responsibilities in an international organization be assumed or shirked as a matter of arbitrary will? What does prudence dictate with reference to the desirable and the possible?

One perceives immediately that answers to these queries will be governed by philosophical considerations of the nature of man, the effects of original sin, the dictates of natural law, the purpose and origin of the state, sovereignty and the international community, the components of peace, etc. All Realists and all Idealists do not begin with the same first principles, nor proceed to the same conclusions. This survey reveals the various shades of opinion held by figures in America's past and present.

Because Catholic philosophy and social doctrine are expressed systematically enough to be applied in such an investigation, it was thought worthwhile to state in parallel fashion the ideas from Catholic sources. The presentation does not challenge explicitly any writer or his thesis, but his degree of harmony or variance with Catholic thought will be self-evident. In casting the spectrum over the broad field, which touches upon topics like colonialism, democracy, foreign aid, socialism, Communism, war and armaments, -- one must sacrifice depth in any single aspect for the sake of bringing manifold ramifications to focus in a single overview.

To illustrate how their values influence their estimate of events, summaries of American history by authors of both persuasions are incorporated. To obtain greater insight into how the Idealist statesmen formulated their policies, rather extensive research was devoted to several incidents in the careers of Woodrow Wilson and Franklin D. Roosevelt.

The Realist claims that he faces life as it is, not as it should be. With this approach, he justifies his skepticism about the ability of nations to transcend self-interest, or to curb the inevitable international conflict by appeals to principle or by resort to institutional devices. Balance of power and threat of force are dominant in his vocabulary; foreign policy is definitely not a philanthropic undertaking. The Idealist pursues the goals of justice among nations, enduring peace, the spiritual and material advancement of mankind, respect for international law, and cooperation in a juridical organization.

The Catholic position corresponds more closely to the Idealist interpretation of international relations, but it differs from the institutional approach to salvation, from the view that power and force are evil, from the opinion that peace can be evolved from materialism. Catholic

thought would contest the definition of Realism in the debate, for spirit as well as matter constitutes reality. While acknowledging the validity of national interest, it insists that this be related to the whole international fabric of which it is a part, and with which it must be made compatible. Microfilm \$7.40; Xerox \$26.35. 581 pages.

**SIGNIFICANT CONTRIBUTIONS OF
AMERICAN INDUSTRIAL RESEARCH
LABORATORIES IN THE DEVELOPMENT OF
ANALYTICAL INSTRUMENTS FOR
THE PHYSICAL SCIENCES, 1900-1950.**

(L. C. Card No. Mic 59-3296)

Frederick Andrew White, Ph.D.
The University of Wisconsin, 1959

Supervisor: Assistant Professor Erwin N. Hiebert

A survey has been made of approximately forty industrial research laboratories throughout the United States. Included have been (1) the large corporate laboratories of Bell Telephone, General Electric, Eastman Kodak, etc., (2) instrument firms such as Bausch and Lomb, and Leeds and Northrup, and (3) independent research institutes such as Battelle Memorial and Arthur D. Little, Inc. The purpose of this survey has been to furnish some historical perspective to the contributions which these industrial organizations have made in the development of the modern analytical tools of the physical sciences, and to determine the stimuli which have generated their efforts.

The areas which have been examined comprise the following: (1) electrical measurements (2) thermometric and vacuum instrumentation (3) optics (4) photography (5) sonics and ultrasonics (6) spectroscopy and spectrometry (7) nuclear instrumentation (8) optical and electron microscopy (9) optical and radio-astronomy, and (10) solid state devices.

It has been shown that whereas nearly all the tools of research took shape within the universities at the beginning of the century, by 1950 the major share of analytical instruments were being developed by industrial groups. In those instances where university work was still in progress, this work was usually a joint venture with an industrial staff. This shift was brought about to a large

degree by the specialization that characterized the growth of industrial research, and which forced the industrial scientist to not only pioneer his chosen area of science, but to develop instrumentation which could make his investigations more effective.

The major and more fundamental contributions to the development of analytical instruments have emerged from the laboratories of the large technically-oriented corporations. The fields of communication, generation and transmission of electrical power, and the chemical and petroleum industries, have provided the main channels. The development of analytical tools has generally not been an objective, per se, and in some instances it has been far removed from the basic charter of the organization. Substantial efforts relating to instruments and critical components has rather arisen as a by-product of intensive exploratory studies in the above areas of corporate endeavor.

The instrument manufacturer has been forced to follow rather than to chart scientific progress, but his role has been an important one in making scientific instruments generally available. The instrument firm has been directly responsible for standardization, accelerating research by conserving professional manpower, and advancing the art of measurement by greatly increasing the precision and adaptability of devices or components. Instrument firms have engaged in extensive collaborative efforts with the National Bureau of Standards, an agency which has served an important function in establishing and improving standards for use in all physical measurements.

The independent research institutes have made no major contributions to analytical instruments, despite their unique place in industrial research.

The above conclusions are substantiated by considerable detailed historical information with respect to all the areas of instrumentation which are treated. The stimulus of military demands has been analyzed and cited as a significant factor influencing the course of instrumentation effort. A limited discussion is also included of the role of the university, the general impact of electronics, new concepts of measurement in twentieth century science, and the effect of patents and licensing.

The comments and opinions of many research directors and senior staff scientists provided the primary source for this analysis.

Microfilm \$4.35; Xerox \$15.30. 337 pages.

JOURNALISM

ATTITUDE TOWARD THE PRESS AS A FUNCTION OF INVOLVEMENT IN CONTROVERSIAL NEWS

(L. C. Card No. Mic 60-980)

Philip Peter Anast, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Bruce Westley

The problem of this study was to gauge the effects of personal involvement in controversial types of news on attitude toward the press. It was hypothesized that persons with relatively high interest in controversial kinds of news were more critical in their appraisal of the press than those primarily interested in non-controversial kinds. It was also predicted that individuals who were more ego-involved in a particular issue were less satisfied with the manner in which the press had treated that issue. Involvement in an issue was measured by extremity of opinion, degree of interest, and estimate of knowledge as concerns the issue.

The problem was guided by the theory that involvement in controversial matters generates defensiveness when neutral or antithetical assertions, facts, and interpretations are presented. It has been demonstrated that one highly involved is likely to perceive neutral statements as hostile to his stand and to operate within a limited range as to what constitutes an acceptable message.

A field study involving 241 respondents, residents of Madison, Wisconsin, provided the data testing both hypotheses. A single questionnaire provided all the necessary instruments.

To test the first hypothesis a news interest inventory of 130 items provided a profile of the respondent's news interests, which was related to his attitude toward the press. Of the 16 news interest categories used, five were considered controversial in nature. These were politics, foreign affairs, economic-industrial news, columns-editorials, and education-public welfare. The categories considered non-controversial in nature were mishaps, crime, sports, comics, church news, science, health-medicine, natural disasters, society, the entertainment world, and human interest stories.

A factor analysis of news interest correlations indicated that persons with high interest in the five controversial types of news form a homogenous group. All five categories contained their highest loadings on the same factor of the four extracted. This finding lent support to the dichotomy of news interests used.

Results strongly supported the first hypothesis. Persons with relatively high interest in controversial news were more critical in their attitude toward the press than those with non-controversial interests, as measured by statements in another part of the questionnaire. The difference proved significant at the .001 level of confidence even when holding the confounding variables of sex and educational level constant. Men were more critical than women, and the better educated were more critical than the less educated.

The second hypothesis dealt with six specific, timely issues. Separate measures of interest level, knowledge perception, and opinion polarization were derived on each and related to satisfaction with the treatment these issues received in the press.

Results were less decisive in this part of the study. Extremity of opinion supported the hypothesis with an eta of .18, significant at the .01 level. Level of interest also supported the hypothesis with a low, but significant, correlation. Knowledge perception related to satisfaction with the press produced a low, but significant, correlation supporting the opposite condition. The significance disappeared, however, when the sample was limited to respondents with high interest in the issue.

Investigation into the curvilinear relationship between extremity of opinion on an issue and satisfaction with press performance on it provided a strong relationship. The more satisfied one was with existing conditions, the more favorable was his reaction to newspaper treatment of the issue. This proved to be the best predictor of satisfaction with press performance as concern specific issues.

The results of this study suggest that the press faces constant problems in meeting the approval of its readers in reporting certain kinds of news, either because of the nature of the news or the characteristics of the audience which pursues certain types of news, or both.

Microfilm \$2.50; Xerox \$6.00. 122 pages.

LANGUAGE AND LITERATURE

LANGUAGE AND LITERATURE, GENERAL

ROBERT BROWNING AND THE DRAMA. BROWNING'S PLAYS VIEWED IN THE CONTEXT OF THE VICTORIAN THEATRE: 1830-1850.

(L. C. Card No. Mic 60-815)

Howard Albert Barnett, Ph.D.
Indiana University, 1959

The years Robert Browning devoted to the writing of poetic dramas were formative years. As a young man coming to William Charles Macready (a leading actor and theatre manager of the 1830's and 1840's), Browning was inexperienced both as a person and as a dramatist. In attaching himself to Macready and Macready's circle of friends, Browning placed himself under influences which were to have profound effects on his life and his poetic career. Before meeting Macready, Browning had published only two works of any significance: *Pauline* (1833) and *Paracelsus* (1835). *Paracelsus* had given him a reputation as a promising poet among a small group of readers. The plays written for Macready did much less to enhance that reputation than Browning and his friends desired, but the experience of writing them and of having them exposed to the criticism of theatre audiences and critics provided the conditions under which Browning developed as a man and as an artist.

The experience changed Browning's poetic technique in a way that made greater objectivity and realism possible. It made him aware of a special kind of reader who would approach a poem in some what the same attitude as a person sitting before a stage. It established for him a special subject (the conflict between an individual's intentions and the world's interpretation of them) which would serve as variously as the human personalities themselves would serve. Above all, it hardened Browning's attitude toward his fellow-men and fellow artists, a fact which would seem to account partially for his ability to endure the years of waiting for recognition.

There were five plays actually intended for stage production: *Strafford* (1837), *King Victor and King Charles* (1839), *The Return of the Druses* (1840), *A Blot in the 'Scutcheon* (1841) and *Colombe's Birthday* (1843). The first four of these plays were written with Macready specifically in mind for the leading roles. The last play was written for Charles Kean, to whom Browning turned briefly after his dispute with Macready. A sixth play, *Luria* (a full-fledged attempt at dramatic form but not intended for stage production), was written under the guidance of Elizabeth Barrett. In the writing of these plays, Browning attempted to relate his concepts of poetic art to the special demands of the early Victorian theatre, dominated as it was by melodrama, the French well-made play and Macready's ambitions to revive the tradition and prestige of legitimate drama.

As a result of the artistic control gained during these years of writing for the theatre, Browning's success with the dramatic monologue was made possible. In the poems

in which Browning put the abilities trained in the theatre most effectively to use, he was most successful in achieving dramatic interest, in using lively diction, in showing insight into human personality and in maintaining the artistic objectivity which contributes significantly to the durability of his best poems. Above all the other influences of the theatre stands the figure of William Charles Macready, whose mannerisms and diction seem to have supplied techniques which enabled Browning to give the characters of his poems a kind of theatrical reality. The years in the theatre laid the foundation for the particular kind of success which was eventually to reward Browning's years of waiting for recognition. Microfilm \$4.45; Xerox \$15.75. 348 pages.

WHITMAN'S "SONG OF MYSELF"

(L. C. Card No. Mic 60-1255)

Loren K. Davidson, Ph.D.
Duke University, 1959

Supervisor: Clarence Gohdes

"Song of Myself," because it is Whitman's first and most complex poem, lies at the heart of his poetry. By examining what he had to say about it many years after its completion in informal comments to friends and associates rather than in his formal pronouncements and by comparing these comments with his conception of the poem implicit in it and expressed in the Preface of 1855, one can see that Whitman was generally consistent. The poem, hence, probably owes more to deliberation than to accident.

His overriding purpose to help the individual realize his divine potential seems to have determined the nature not only of the content but also of the form. Evidently he considered the poem a revelation of transcendent truth and he gradually conceived of the representative mid-nineteenth-century American as the means of presenting it. In doing so he transformed materials he appears to have borrowed from his earlier poetry, from "Pictures," for example.

The materials Whitman used in composing "Song of Myself" are remarkably diverse: indigenous art, works of literature, popular compendiums, newspapers, literary journals, conversations with friends, and his personal observations and experiences. Many clues to them are supplied in the miscellaneous collections he preserved of information that interested him. In addition to the multitude of impressions which flooded upon him from the world, in a few instances he resorted to research in using specific historical incidents.

His development of these sources is demonstrated thoroughly in the many surviving manuscripts of the poem. They range in character from the first glimmer of an idea to what may be a page of copy for the first edition. His practices in handling them are discussed under six heads: flexibility, expansion, progression, repression, conversion,

and indirection. Flexibility is indicated by the following: the poems of the first edition are related in their manuscript stages, many passages were originally prose, and some lines were fitted in only after several trials in different contexts. Whitman's adoption of an optimistic tone and of a symbolic method called "indirection" is clearly revealed in the manuscripts.

Not satisfied with the poem, Whitman revised it extensively in the 1856, 1860, 1867, 1871, and 1881-1882 editions of *Leaves of Grass*, albeit without major changes in either structure or idea. His revisions are chiefly of two kinds, mechanical and rhetorical. Sensitive to typography, he attempted by means of capitalization and punctuation to clarify his comment. In the text, he sometimes supplied lines which explain sections. Although he also continued to improve his "indirect" passages, he became increasingly sensitive to esthetic and conventional ideas about poetry. In spite of the poet's tedious efforts, many revisions are sporadic or inconsistent and sometimes are dictated by whim. He repeatedly abandoned previous revisions and adopted others foreshadowed in earlier editions.

Just as many of his "indirect" passages are illuminated by his manuscripts, so his attempts to organize the poem cannot be understood without reference to his underlying view of nature which comprehends flux, purposive evolution, and polarity. Though in the poem elements of stream-of-consciousness, logical, and thematic organization can be found, the method of analysis nearest to Whitman's practice appears to be that of theme. In "Song of Myself" the "I," representing the individual, progresses toward self-realization by reacting to the multiplicity of life, represented by the "grass" symbol. The progress has three stages: "dilation," or the achievement of individuality; "sympathy," recognition of relationships with all being; and orientation in the universe. Nature provides loyal opposition and is depicted as both objective and symbolic in order that the poem may function as nature does.

Microfilm \$7.50; Xerox \$26.55. 590 pages.

**SCIENCE IN UTOPIA: A MIGHTY DESIGN.
A STUDY OF SCIENTIFIC UTOPIAS IN THE
SEVENTEENTH CENTURY.**

(L. C. Card No. Mic 60-1137)

Nell P. Eurich, Ph.D.
Columbia University, 1959

This study is an analysis of the impact of early scientific thought on imaginative societies. Utopian programs are evaluated according to the emphasis placed on natural philosophy and the subjects comprising it, the general attitude toward the "new thought" and the conquest of nature--the goal of science.

The major works selected for inclusion are the following: Andreae's *Christianopolis*, Campanella's *City of the Sun*, Bacon's *New Atlantis*, and two continuations of the *New Atlantis* written by R. H. and Joseph Glanvill. Also included are partial utopias or specific plans for scientific advancement, such as those proposed by William Petty and Abraham Cowley. It is shown that the authors were serious, optimistic reformers who believed in the possibility of establishing the perfect society on this earth and in the

immediate future. Although the authors were not usually engaged in actual scientific research, they were informed about the latest developments and served as propagandists for the new science.

In order to clear the way for the foundation of the improved society, they answered the authorities opposing scientific progress. Utopists rejected firmly the belief in superiority of the Ancients and the established educational curricula which did not include the newer subjects. They answered church doctrine which discouraged man's efforts to learn the secrets of nature.

Utopists centered their hopes on the scientific method which was to create the new world. They thoroughly condemned the deductive method and generally ignored the mathematical and quantitative approach. Instead, they enthusiastically supported the empirical method based on observation and the inductive process. Extensive fact-collections furnished the materials for research. Detailed descriptions of the laboratories, ingenious equipment and instruments devised by utopists are given in the study.

While attention was given to the advancement of theoretical knowledge in scientific utopias, heavier emphasis was placed on practical results. Utilitarian standards were foremost when utopists proposed technological inventions. The outstanding areas in which science was applied for the benefit of man were: agriculture, medicine, industry and mining, commerce and communication. The study shows that these same areas were actually of major importance in the English economy of the period. Thus utopists gave their imaginative solutions to the real problems of society. Finally, the dissertation concludes with a description of the dominant position awarded to the scientist-inventor in utopian lands.

Certain limits are clearly imposed on this study. After the initial group of authors--Andreae, Campanella, and Bacon--who first projected a new scientific society, the study includes their successors in England only. Furthermore, there is no attempt to describe the total societies proposed by utopists or to give full details concerning the authors' lives and other works. The study concentrates on scientific elements in the new type of utopia which appeared in the seventeenth century.

Microfilm \$2.75; Xerox \$9.45. 209 pages.

**COOPER AND THE NAVY.
(PARTS I AND II).**

(L. C. Card No. Mic 59-6779)

Edwin Malburn Hall, Ph.D.
The Pennsylvania State University, 1959

The biographies of James Fenimore Cooper tend to slur over his connection with the United States Navy and its influence upon his works. The present monograph is intended as a supplement--not a replacement--for the extant biographies.

Cooper's connection with the navy had a great and continuing influence upon his works. His actual contact with it was just enough to give him a superficial familiarity with the navy and naval life, while at the same time he was able to retain some of his Romantic illusions about it. The present work puts stress on Cooper's one voyage

in the merchant service, which was undertaken to qualify him as a naval officer; on his actual naval service in New York harbor and on the shores of Lake Ontario; on his relations with the navy and naval officers during his trip to Europe in 1826; on his role as a leading spokesman for the navy during the lean years of the late 1830's and early 1840's; on his History of the Navy and the bitter controversies that resulted from it; on his protracted fights with Commander Alexander Slidell Mackenzie, at first over the Naval History, later over the commander's action aboard the brig Somers; and on his continued interest in the navy, as shown at the time of Captain Ben Cooper's brush with naval authority. Cooper's novels have been studied in chronological sequence with emphasis on the elements in them which display their author's naval interests. Attention has also been given to such of the non-fiction as reflects the same interests, particularly the History of the Navy, the biographical sketches of naval officers, the materials on the Lake Erie controversy, and the attack on Mackenzie in regard to the Somers affair.

Microfilm \$7.10; Xerox \$25.20. 557 pages.

WORD USAGE TECHNIQUES IN SPELLING

(L. C. Card No. Mic 59-6753)

Mariam J. McSweeney, Ed.D.

Boston University School of Education, 1959

The purpose of this study was the evaluation of a program to improve the application of spelling words to written language. It was designed so that the pupils were stimulated to use the spelling words in a variety of controlled written language situations. The study aimed to determine the effectiveness of these exercises in improving:

1. The ability to transfer spelling words to written language.
2. The ability to spell words accurately.
3. The ability to spell the derived forms of the spelling words.
4. The knowledge of the meaning of spelling words.

To conduct this experiment, eight classrooms were selected for the experimental group with a final population of 262 pupils; eight were selected for the control group, giving a final population of 254 pupils.

The length of time of the study was a period of eight weeks. Since 18 new words were taught each week, the total number of spelling words was 144. These words were blocked off by monthly periods, so that 72 words were presented in the exercises.

These exercises were used by the pupils on three days, Tuesday, Wednesday, and Thursday. They involved the use of the spelling words of the month plus their derived forms. To check the accuracy of spelling words used, the pupils turned to the reference sheet, which listed alphabetically the spelling words and their derivatives.

On the other two days, Monday and Friday, the words of the week were introduced and then tested.

The pupils worked on these exercises in teams of three, homogeneously grouped so that they could discuss ideas and then write the exercises.

The procedure of the control group was that suggested by Word Mastery Speller,¹ the textbook.

To measure the gains in transfer of spelling words, the synonym context test and the composition measures were used. For determining gains in accuracy of spelling, the spelling inventory and the Metropolitan Achievement Test² were presented. The use of derivatives of spelling words and spelling words as synonyms were measured by tests designed by the writer.

In determining the gains, comparisons were made on the entire experimental and control groups; on 97 matched pairs; and on the experimental group, divided into four achievement sections; excellent, good, fair, and poor spellers.

The specific practice in using the spelling words in written language resulted in the following findings:

1. A significant gain in the appearance of spelling words in a "synonym context test" which required that the pupil substitute a word from the spelling list which meant the same as the underlined word. All achievement areas made significant gains, but the greatest gain was made by the excellent spellers.
2. A significant gain in number of words from the spelling list appearing in the composition of the pupils. The excellent spellers made most significant gains.
3. A significant gain in ability to spell accurately the words taught during this period as measured by the spelling inventory.
4. A gain in the ability to spell words accurately in the Metropolitan Achievement Test.
5. A higher mean score in spelling accurately the derived forms of the spelling words. This test required that the pupil write the derivative, dictated by the teacher in context.
6. A higher mean score in the use of words from the spelling list as synonyms, tested by definitions test. This test required knowledge of meanings of the words.

Microfilm \$3.70; Xerox \$13.05. 287 pages.

1. Patton, David H., Word Mastery Speller, C. E. Merrill Co. 1951.

2. Metropolitan Achievement Test, World Book Company, Boston, Massachusetts.

AN ANALYSIS OF SOME PATTERNS OF COMPARISON IN THE MATTER OF ENGLAND ROMANCES

(L. C. Card No. Mic 60-1075)

Zelda Jeanne Rouillard, Ph.D.

University of Colorado, 1959

Supervisors: Associate Professor Marjorie Kimmerle
Associate Professor Mabel Van Duzee

The purpose of this dissertation is to consider some of the major patterns of comparison in the Matter of England romances (Athelston, Beves of Hamtoun, Gamelyn, Guy of Warwick, Havelok, King Horn, Reinbrun, and Richard the Lion-Hearted) and to determine whether they are used conventionally. Although many questions arise, they are not answered definitely, for they serve primarily to suggest problems that need further study.

By using V for all but linking verbs, N for nouns and

pronouns, and A and A_v for descriptive adjectives and adverbs, it is possible to indicate graphically the recurrent patterns (i.e., "as white as a swan" = as A as N; "the best knight that might ride" = the A-est N that might V) and to show that the Matter of England poets relied on fourteen major ones. These include seven true comparisons: (1) as A as N, (2) A-er N, (3) A-er than N, (4) N-A, (5) like N, (6) as A as if N were V, and (7) as A as N V (were); and seven implied or suggested comparisons: (1) the hyperbole, (2) the metaphorical use of nouns and verbs, (3) the phrases of worthlessness, (4) the word *peer* combined with certain words to convey the superlative, (5) that (N) might (dared) V plus A-est or none so A to express the superlative, (6) the non-superlative produced by certain combinations of that (N) might (dared) V with no N, and (7) tags--(a) those used alone, and (b) those used in combination with one or more of the other patterns to produce a comparison.

With the exception of the hyperbole and the metaphor in which the words themselves are important, all the patterns can be reduced to formula. An analysis of the occurrences of these formulas shows that, almost without exception, they are used conventionally. Similarly, the nouns, verbs, and descriptive adjectives and adverbs in the formulas are conventional. Certain combinations of noun and adjective, or of noun and verb are almost inevitable: regardless of the situation, a beautiful maiden or a valiant warrior or a terrifying dragon is customarily described by a conventional pattern. That some of the expressions are merely meaningless fillers is evident by their repetition. Apparently, many are used simply because they complete the rhyme scheme. Almost all the formulas may be expanded by prepositional phrases or subordinate clauses as modifiers of the nouns, verbs, adjectives, or adverbs.

The three tags that are used independently of other patterns of comparison occur only a limited number of times. However, the three appearing with at least one other pattern of comparison occur frequently, many times only in a conventional manner to complete a rhyme scheme or fill out a line.

In most of the patterns of comparison, a superlative degree is stated or implied. A that (N) might (dared) V clause appears in many of these patterns, as in that A-est N that might V. This frequency of the superlative suggests that it was no more than another of the conventions of comparison. Similarly, the special use of the word *peer*, the phrases of worthlessness, and the non-superlative are conventional.

This dissertation indicates to what extent the Matter of England poets relied on conventional patterns of comparison, reveals something of the status of many Middle English words, and suggests matters that need further investigation. Microfilm \$4.10; Xerox \$14.40. 319 pages.

DRAMATIC TREATMENTS OF THE TRISTAN AND ISOLT TALE: A COMPARATIVE STUDY.

(L. C. Card No. Mic 60-947)

Edward Bernhard Savage, Ph.D.
University of Minnesota, 1959

The purpose of this study is to investigate a subject neglected to date by scholarship: the artist's role in the progress of the Tristan tale. This study aims to discover the influence of (1) the artist on the tale, (2) the tale on the creative artist, and (3) the cultural milieu upon both artist and tale.

We contend that *Tristan's* original conception was dramatic. Therefore, *Marie de France's Chevrefoil* has been examined as a hymn to love adapted from Celto-Germanic quasi-dramatic oral tradition. The combined image of the hazel and the honeysuckle is *Marie's* original contribution to the *Tristan* tradition. She conceived that image as a symbol of undying love.

In subsequent redactions, *Marie's* symbol of undying love was adopted in the combined image of the rose and the vine issuing from the tombs of *Tristan* and *Isolt*. In the metamorphosis of the image from the honeysuckle and hazel to the rose and vine, we discerned the phenomena of dehumanization and Christianization of the original pagan, humanized image. These phenomena combined with rationalization to deindividualize and Christianize the characters of the tale, to rob the incidents of their fantastic flavor, and to relegate the central motif, the illicit love of *Tristan* and *Isolt*, to a minor detail in the larger framework of Arthurian romance.

Wagner recentered the tale upon the illicit love of *Tristan* and *Isolt*. However, under the influence of the neo-classical stage and Victorian morality, he changed the playful courtly love of the romance to the relentless fatalistic love of, for example, *Phèdre*. Thus he recreated the tale as a heavy German music-drama based upon the conflict of love and Duty. The prime spokesman for relentless love in *Tristan und Isolde* is Wagner's orchestra. The orchestra creates an atmosphere of passion and, through its statement of leit-motifs and dissonance versus harmony, directs the action. Wagner's devices of the folk-song and courtly characterization fail to establish a medieval courtly spirit. His music-drama remains a powerful and wholly serious drama of adultery in which sex is at once sin and salvation.

Jean Cocteau, in his film, *L'Eternel Retour*, attempts to repatriate the tale by utilizing the medieval romancer's device of contrasting and contradictory images. These images are presented separately, in juxtaposition and in series so that the audience, rather than assigning definite symbolic meaning to the image, will preserve a crucial ambivalence toward the image's (or images') suggestive powers. Cocteau utilizes the camera to present the images or combinations of images described. However, because Cocteau's relatively complex syntax has, for the most part, escaped film audiences (who are inclined to be uncritical) *L'Eternel Retour's* influence upon the progress of the tale had been negligible.

We have attempted to evaluate the relative influence of the authors, the original tale, and the cultural milieus on the creation of a work of art. We have concluded that no one of these influences supercedes the other, but that their

combined influence has been responsible for the wealth of works of art based upon the tale of Tristan and Isolde.

Microfilm \$4.45; Xerox \$15.75. 347 pages.

GOETHE'S REACTION TO CRITICISM AS MIRRORED IN HIS LETTERS (1764-1805)

(L. C. Card No. Mic 60-1221)

Truman Marion Webster, Ph.D.
The Ohio State University, 1959

"Goethe's Reaction to Criticism" attempts to fill one more "Lücke" in Goethe research through an analysis of his attitudes toward the acceptance of his writings by his contemporaries. This study includes, as essential elements of Goethe's attitudes, his purposes and methods of writing, circulation and safeguarding of manuscripts, requests for opinions and assistance as well as reactions to the responses of friends, critics and public.

Goethe's letters from 1764 until Schiller's death in 1805 (Weimar Edition, Vols. I-XVIII) constitute the primary source, supplemented by autobiographical and literary works and the conversations and letters of contemporaries. The periods of his literary activity form six natural chapter divisions: 1764-1775, 1775-1786, 1786-1788, 1788-1794, 1794-1805 and Schiller.

From childhood Goethe wrote out of an irresistible, inner urge to clarify through poetry everything which interested or plagued him. He wrote primarily for his friends and with them in mind, deriving satisfaction from their pleasure and encouragement from their responses.

He earnestly sought criticism, took pleasure in favorable comments, but decried the lack of specific and constructive critiques from friends and critics alike. He had no tolerance for trivial objections, but responded to major criticisms with careful study, explanations--and alterations, when they did not weaken the structure of a work or conflict with his purpose in the development of a character.

He valued above all those criticisms which showed that the reader had regarded a work as a whole, that he had been stimulated to further thought by it, and that he had understood the author. But he was convinced that no amount of praise or blame could help a poet who lacked talent. Goethe placed special value on the criticisms of certain individuals, occasionally suggesting a method of approach to a work; but he bristled when his works were treated with levity, misunderstood or ignored. He was disappointed in the tendency of friends and public to cling to works already familiar to them and to reject the alterations he felt necessary in their revision. The various proposals to translate his works of this period into other languages were warmly welcomed, but Goethe was apprehensive of the success of his *Hermann und Dorothea* among the "eingefleischten Aristokraten" of the French Republic; he was at a loss to understand the deviations from the tempo, form and text of the same poem in Holcroft's English translation, and it was only with a second reading that he began to enjoy the Italian translation of *Werther*.

Goethe's injury from early criticism caused him to take Götz over the heads of the critics to the public. At twenty-four he would have nothing to do with critics, and in Weimar turned his back for eleven years on critics and

public alike, drawing inspiration and reactions from the handful of intimate friends at court. The publication of his works returned him to his greater public, but the poor reception of *Iphigenie* and *Tasso* drove him into isolation and to scientific studies. The hope of still reaching the educated public forced him to continue to write, and through Schiller's interest, criticism and goading he experienced renewed poetic productivity.

Microfilm \$5.25; Xerox \$18.70. 412 pages.

SOME PASSIONATE PILGRIMS: THE IMAGE OF ITALY IN AMERICAN ROMANTICISM.

(L. C. Card No. Mic 60-956)

Robert Lee White, Ph.D.
University of Minnesota, 1959

During the first two-thirds of the nineteenth century, Italy was the European land which most attracted Americans. The nature of the Americans' fascination was ambiguous. They were attracted to Italy, but they shrunk away from what they observed there. In the imagination of Americans Italy was a land of beauty and charm, but it was also a land of corruption and temptation. This study utilizes nineteenth-century travel accounts, journals, paintings, poetry, and fiction to demonstrate how Americans reacted to the spell of Italy.

The first chapter describes the inception and growth of American interest in Italy. Subsequent chapters treat in detail the image of Italy to be discerned in the works of ten Americans: Washington Irving, Peter Irving, Washington Allston, James Fenimore Cooper, Nathaniel Willis, Theodore Fay, Henry Tuckerman, William Story, Nathaniel Hawthorne, and William Dean Howells. All spent some time in Italy, all kept journals or wrote accounts of their sojourns, and all made artistic use of their Italian experiences.

The ambiguous nature of the American response to Italy is neatly demonstrated in the work of Washington Allston. Allston portrayed on canvas an Italy which is an ideal land of calm and classic beauty, a land inhabited by picturesque and attractive people. His novel *Monaldi*, however, depicts a harshly beautiful land peopled by a race prone to violence and fouled by moral corruption. This conflict between the two images of Italy runs through the whole of American romantic art and literature dealing with Italy. The painters who followed Allston, even those who were violent Italophobes, could but repeat his image of Italy as Arcadia. Americans who wrote of Italy generally admitted that it was a land of charm, but they suspected that the fascination of Italy was unwholesome, and most of them were convinced that America was Italy's moral superior. In American fiction and poetry, the predominant image of Italy is that of a mask of beauty concealing violence and unspeakable corruption. This image even gleams through the work of men who were professed friends of Italy.

Of all the men discussed at length in this study, only Cooper and Tuckerman did not project an image of Italy which might be compared to the type of the "dark heroine" in nineteenth-century fiction. Cooper and Tuckerman enjoyed their stays in Italy, they were favorably impressed

by Italian society, and in their fiction they portrayed Italians sympathetically. Cooper made an Italian maiden the "Blonde heroine" of *Wing-and-Wing*, and Tuckerman married the American heroine of *Isabel*; or, *Sicily* to an Italian.

The other writers discussed, in varying degrees, consciously and unconsciously, portrayed Italy as a land of unwholesome charm. Washington Irving's *The Tales of a Traveller* and his brother's *Giovanni Sbogarro*, both published in the 1820's, depict an Italy beset with banditti and bloodshed, a land where corruption and passionate violence lurk within the lovely landscape. A generation later, Fay and Willis, in *Norman Leslie* and *Paul Fane*, continued to present an Italy beautiful but corrupt. These two novels, which wholeheartedly make use of the "international" theme, specifically insist upon the moral superiority of America to Italy. William Story and the young Howells were ardent admirers of Italy, but Story's poetry suggests an Italy not very different from that of Washington Irving, and Howells' early novels dealing with Italy also point up Italian corruption and American superiority. And Hawthorne's *The Marble Faun* is, in spite of its Roman lights and shadows, a novel which insists that Italy is but a specious Arcadia--a novel which moves always toward a rejection of Italy and a return to the more wholesome atmosphere of America.

Microfilm \$6.15; Xerox \$21.85. 483 pages.

LANGUAGE AND LITERATURE, CLASSICAL

A STUDY OF INVOCATIONAL FORMULAE IN EARLY GREEK ORAL POETRY

(L. C. Card No. Mic 60-1152)

William Warren Minton, Ph.D.
Columbia University, 1959

Once powerful symbols of the oral poet's control over his technique and traditional material, the Muses had by the time of Homer and Hesiod become little more than stock figures in invocalational formulae. Of their original character, which suggests an alliance with knowledge and enumerative or "catalogue" presentation not unlike the manner and emphasis found in other traditions of oral poetry from the ancient Near East to modern times, and which must reflect something of the nature of the earlier Greek poetic tradition, only residual traces remained, buried for the most part in the stock forms and contexts of Muse invocations but still potent enough to stimulate a brilliant revitalization by Hesiod and to color Homer's handling of narrative. Analysis of the invocations themselves reveals four basic characteristics: all are (1) appeals for an ordered enumeration, invariably followed by at least some trace of catalogue, (2) questions, to which the following material represents an answer; (3) in addition, in Homer all invocations initiate a clear action-sequence progressing from crisis through struggle to final defeat for the party on whose behalf the invocation is made, and (4) in all cases this party is that of the protagonists (Greeks). These elements are traditional usages

to which the poet was obligated; their original meaning and associations now for the most part lost, they tend to be used, particularly by Homer, for independent artistic ends. The basic invocalational unit, derived from the hymn and with a relatively fixed and elaborate formal pattern allied to that of the hymnic prelude, is the proem-invocation. In Homer the proem-invocations are distinctively used to set the tone for and apparently guide the disposition of the other invocations. In the first place, they forecast only the first part of the action of their poems and point up the fact that these initial sequences, no less than those introduced by all other Homeric invocations, are built on the characteristic progression of crisis-struggle-defeat. Secondly, these briefer internal invocations (actually found only in the *Iliad*) are precisely coextensive with this initial area of the action: they appear nowhere else. Distributed strategically within it they mark the important crises in its development; subsidiary crises are pointed up by related quasi-invocalational forms and substitutes. In spite of the evidence of increasing artistic usage the old catalogue associations of the invocations persist, reflected notably in a further, distinct, and striking schematization by which every internal invocalational unit in the *Iliad*, regular or subordinate, along with its following catalogue, is balanced by and paired with one of the major independent catalogues in the poem. The lack of internal invocations in the *Odyssey* is accounted for by the fact that the initial "defeat" portion of the action is related not by the poet but by Odysseus. In Hesiod, all of whose invocations, whether initial or internal, are built on the fuller proem-invocation pattern, the hymn element to be associated with that form is noticeably stronger, more pervasive, and more freely handled. In contrast to the elaborate patterning found in Homer the invocations here are arranged in paratactic rather than hypotactic fashion: each is apparently intended to prelude the whole of the poem or section it introduces, not a part only, functioning as a comprehensive "proem-invocation" for that unit. These differences in invocalational usage between Homer and Hesiod probably reflect two different strands of oral tradition rather than individual divergences of the poets themselves. Finally, the invocalational pattern at the beginning of some of the Homeric Hymns supports the derivation of proem-invocations from hymnic preludes; exceptional forms in both Hesiod and in Cyclic Epic may be explained from this hymnic base.

Microfilm \$3.70; Xerox \$13.05. 288 pages.

LANGUAGE AND LITERATURE, LINGUISTICS

A MORPHOLOGICAL STUDY OF THE VERB IN OLD FRENCH

(L. C. Card No. Mic 59-6335)

Donald F. McCulloch, Ph.D.
New York University, 1959

Adviser: Pauline Taylor

This study, under the direction of Miss Pauline Taylor Professor of French in New York University, examines

the verb system of Old French, as it appears in a manuscript of 31,412 lines of the late twelfth and early thirteenth centuries.

The materials on which this study is based are the epic poems *Garin le Loherain* and *Gerbert de Mez*, which are contained in Ms. A (*Bibliothèque de l'Arsenal* 2983). Other versions of these *chansons de geste* occur in a large number of manuscripts and fragments. Ms. A was published by Josephine T. Vallerie (*Garin le Loherain*) and Pauline Taylor (*Gerbert de Mez*) in 1947 and 1952 respectively.

The verb forms and data obtained from the two *chansons de geste*, which appear as a unity in Ms. A, are compared with the data found in the basic study on the verb by Pierre Fouché, *Le verbe français* (1931), as well as with many other documents of the Middle Ages. Professor Fouché's work covers French verb development from the Old French period to Modern French and contains considerable information about the dialects.

Due to the fact that there is, so far as we know, no other Old French verb study based on a source of comparable length, this investigation presents, we hope, unique information for judging the stage of development of the Old French verb in the period of the close of the twelfth and the opening of the thirteenth centuries, and for comparing and checking with material presented by other scholars.

The major divisions of the present work, some 300 typewritten pages, consist of: 1) a study of the verb endings of the indicative, subjunctive, imperative and infinitive moods; 2) a brief examination of the compound tenses; 3) a study of the stem and its variants; and 4) a glossary of the verb forms found in Ms. A.

Microfilm \$4.00; Xerox \$13.40. 310 pages.

A DESCRIPTIVE ANALYSIS OF WORD FORMATION IN OLD SPANISH

(L. C. Card No. Mic 60-938)

Richard August Narváez, Ph.D.
University of Minnesota, 1959

Word formation is one of the cornerstones of linguistic knowledge. A native speaker handles phonology, syntax, and basic vocabulary. Moreover, he is able to employ certain formative processes within the language. These processes (affixation and compounding) are contemporary (synchronic) and bring forth normal responses from his fellow speakers. We may refer to these processes as word formation.

This study deals with word formation in the Spanish or Castilian tongue of the medieval period. It is divided into two major parts. Part I contains the Commentary; Part II has the Classified Lists. These two parts have parallel-numbered sections for easy cross reference.

Both the Commentary and the Classified Lists are divided into a verb, adjective, noun, particle, and zero-change section. Each section, except the zero-change section and the lists of underived words, has been subdivided into sections on compounds and suffixed words.

We can draw both major and minor conclusions from this study, but here only the major conclusions are considered. If all the words listed in the Classified Lists are

counted, we find a grand total of 3973 words analyzed. Of these, 407 are underived words. That means that approximately seven-eighths of the vocabulary analyzed in this study is made up of compounds, affixed words, or zero-change words. But even more important is the fact that of the approximately 8000 vocabulary items found in the *Tentative Dictionary of Medieval Spanish*, almost one half of them (3566) show a formative feature of some type.

Another major conclusion is that the verb employs compounding much more than the other parts of speech. There are 493 compound verbs, seven of which have double prefixation.

The single most productive feature is suffixation, where the noun dominates. As for variety of affixes, it is also the noun with 81 suffixes which surpasses all other categories.

This study includes zero change as a formative device. No known study of the Spanish language contains a discussion of this feature, because linguists have become aware of this process only in recent times.

If we compare compounds with suffixed words and zero change, we find that zero change with 914 examples is more productive than compounding with 797. Zero change which up to now has not been considered of importance in Old Spanish -- if it has been considered at all -- is thus revealed as a major process of word formation in Old Spanish. Microfilm \$5.60; Xerox \$19.80. 440 pages.

SOME TEMPO MANIFESTATIONS OF THE TERMINALS OF ENGLISH

(L. C. Card No. Mic 60-1013)

William Bullard Newcomb, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Martin Joos

The terminals of English, which were first described as a set by George L. Trager and Henry Lee Smith, Jr., (*An Outline of English Structure*, 1951), include: SINGLE-BAR /|/, a sustentation at the previously marked pitch level; DOUBLE-BAR /||/, a terminal pitch rise from the previously marked pitch level; and DOUBLE-CROSS /#/, a terminal fade. It has since been suggested that another important phonetic characteristic of the terminals in English is additional length in the segments immediately preceding the juncture. This study was undertaken in order to test this hypothesis, and to determine the domain within which this terminal retard operates.

Eight pairs of sentences were selected which differed mainly in the presence or absence of the terminals under investigation. These sentences were repeated ten to fifteen times by three speakers, and from these recordings those sentences were selected which most clearly displayed the desired contrasts, and spectrograms were made from them. Cuts were made, in accordance with a proposed theory of syllable boundary, at the point of release of the last consonant before the onset of voicing, or in the case of syllables separated by semivowels, at the beginning of the return from the extreme point of formant deflection, toward the position of the next vowel. The two spectrograms for each sentence-pair were aligned, one above the

other, and the end-points of the cross-bar of a tee were placed on comparable cuts on the two spectrograms. Their position relative to each other in time determined the location of a third point at the end of the elongated upright of the tee. As this device was moved from one cut to the next, the third point was deflected proportionally as the length of the segments varied. When these points are connected, they form a graph which represents a quantity contour, with time on the horizontal axis and tempo differential on the vertical axis.

The data thus consist of one hundred and fifty graphs produced by this method. They show that there is a certain amount of variation in syllable length which may be considered as noise, and which is fairly constant at approximately ten percent of the greatest variation, but those syllables which immediately precede a terminal are consistently longer than the same syllables when there is no following terminal. This extra length is in all cases more than sufficient to raise the contrast above the level of random variation. There is some indication that for certain speakers the domain of the terminal may extend over several syllables in a gradual contour. This may be a function of sentence structure, dialect variation, or other factors.

Some evidence was collected by this method which indicates that internal open juncture, or plus /+/, makes use of syllable length variation as one of its phonetic features. The magnitude of the variation observed is sometimes no greater than the noise level, but the variation is consistently in the same direction, so it must be considered to be at least conditioned by the plus, if not a determining feature.

This investigation confirms the hypothesis that the terminals as a set are marked, in part, by a retard, and establishes the syllable which immediately precedes the terminal as the domain of that retard.

Microfilm \$2.85; Xerox \$9.90. 220 pages.

AUXILIARY VERBS IN THE PROSE WORKS OF ALFONSO X

(L. C. Card No. Mic 60-1030)

Lynn Warren Winget, Ph.D.

The University of Wisconsin, 1960

Supervisor: Professor L. A. Kasten

The purpose of this study is to investigate Old Spanish auxiliary verbs and their uses on the basis primarily of the Alfonsine prose texts extant in manuscripts of the Royal Scriptorium. An auxiliary verb is here understood to be one which, when combined with another verb, expresses a tense, aspect, mode, or voice of the second verb. In addition, most verbs partially lose or alter their original meaning when used as auxiliaries, but this is not here considered an essential prerequisite of auxiliaryity. Some thirty different verbs occur on occasion as auxiliaries in Alfonso, but only the most representative and widely used are mentioned below.

Two concepts are expressed by tense auxiliaries: future action and perfect action. *Aver* a or *de* plus infinitive is (aside from the future and conditional tenses proper)

the principal expression of future time. *Aver* plus a past participle (which often agrees with either a preceding or a following direct object) forms the perfect tenses of transitive verbs; reflexive verbs and a number of intransitive verbs use either *aver* or *seer*. *Aver* and *tener* are interchangeable as auxiliaries of the "perfect state" resulting from an action.

The most important use of auxiliaries of imperfective aspect in Alfonso is found in the "progressive" constructions formed from an auxiliary (notably *estar*, *seer*, *ir*, or *andar*) plus a present participle. The use of *solér* (or occasionally *usar*) plus infinitive to express customary or habitual action is also imperfective. Perfective aspect is represented by a rather wide variety of auxiliaries (all followed by the infinitive) indicating that an action is begun (*començar*, *empeçar*), ended (*acabar*, *dexar*, *quedar*), accomplished (*venir*, *llegar*, *uviar*), or performed again (*tornar*).

Three concepts are expressed by modal auxiliaries: potentiality, volition, and obligation. Potentiality can be divided into ability, possibility, and permissibility, all of which are expressed by *poder*. *Saber* is also used occasionally to indicate ability, usually mental ability. Volition includes the categories of desire and acquiescence, both expressed by *querer* and the former also (very rarely) by *dessear*. In the area of obligation, necessity is indicated by *aver* a or *de* plus infinitive, inference by *dever*, and moral or circumstantial obligation by both *aver* and *dever* used virtually interchangeably.

The only auxiliary used to form the true passive voice is *seer*. The Alfonsine passive is always either perfective or (if imperfective) iterative; it is never durative. The passive state resulting from an action can be expressed by either *seer* or *estar*.

An additional type of auxiliary is the so-called "flectional" auxiliary, which does not add anything to what would be expressed by the corresponding simple verb form. This usage is represented in Alfonso by some of the occurrences of *aver* a or *de* plus infinitive.

In general, Alfonso's use of auxiliary verbs is reasonably similar to that current today, but it should be mentioned that several of the most widely used modern auxiliary constructions occur only very rarely or not at all in Alfonso. These include the expression of necessity by *tener* *que* plus infinitive, of future time by *ir* a plus infinitive, and of continued action by *seguir* plus present participle. Microfilm \$2.50; Xerox \$6.40. 133 pages.

LANGUAGE AND LITERATURE, MODERN

THE SEARCH FOR FORM: AN EXAMINATION OF THE LITERARY THEORY AND TECHNIQUE OF CUBISM, FUTURISM, DADA, AND SURREALISM.

(L. C. Card No. Mic 60-1248)

Charles Lynford Adams, Ph.D.

University of Oregon, 1960

Adviser: John C. Sherwood

This thesis begins with an introduction to some of the problems of literary form, and suggests that since new

concepts determine new forms, and since these forms are essential to the full expression of the concepts, we owe it to ourselves to understand those forms which our period has produced. The introduction further suggests that since poetic forms are the result of processes of relating poetic elements, we must, in order to understand these forms, comprehend not only the various poetic elements, but the processes which poets have used to relate them. Cubism, Futurism, Dada, and Surrealism represent fifty years of organized structural experiments which, since they did not respect linguistic or geographical boundaries, did much to form that milieu which is still with us.

This study attempts to clarify each movement itself and to define the literary theories and techniques of each. It attempts to make clear the relation of each of these movements to the others and to indicate what each contributed to the total milieu of the first half of this century. It attempts to clarify the goals which the members of each movement were trying to achieve, to indicate the elements out of which their poems were composed, and to clarify and illustrate the form-determining techniques which these poets employed in the construction of their poetry.

This study notes that in literary Cubism the poetic elements were "fragments of experience" (later, any images selected by the poet) and the primary structural technique was spatial (i.e., the juxtaposing of selected elements according to the intuitive dictates of the poet). The goal of the Cubists was a unified poetic effect, at first of a more "real" representation, later of "pure" poetry.

In literary Futurism, the elements were sensations and analogical images, and the primary structural technique was chronological (relating the elements according to the chance of their happening), usually without conventional syntactical or conjunctive devices. The goal of the Futurists was the "accurate" representation of a particular experience.

For the Dadaist poets the elements of poetry were anything the individual poet wished them to be, and their structural techniques ranged from any previously established technique to any new device that could be thought of. The Dadaists exercised complete freedom both in the selection of poetic elements and in the means of relating them. Their goal was not representation but freedom from dogma, and they considered the production of nonsense an ideal weapon. By employing the Cubist and Futurist devices, however, they perpetuated these forms and disseminated them on an international basis.

The elements of Surrealist poetry were subconscious images. The primary structural technique of these poets was at first the substitution of subconscious dictates for conscious organization, and later a conscious ordering of the subconscious images. The goal of the Surrealists was the attainment of a higher form of reality--the surreal--through the liberation and utilization of subconscious forces. This study notes that the change in structural techniques of the Surrealists--i.e., the use of a conscious ordering of the subconscious images--marks an end to almost fifty years of organized structural experimentation, for when the Surrealists began to permit the exercise of conscious control in the relation of their images, they could not avoid a return to established language patterns, to traditional means of expressing relationships.

This study attempts to illustrate and analyse the poetry of each of these movements and to relate typical poetic expressions to the fundamental theory of the movement.

It is hoped that this work will enable a reader to recognize any of the techniques when they appear in subsequent poetry and to understand the original motivation and theory behind each technique. Microfilm \$2.75; Xerox \$9.45. 209 pages.

THE LITERARY OPINIONS OF MADAME DE SÉVIGNÉ

(L. C. Card No. Mic 59-5150)

Philip Elwyn Arsenault, Ph.D.
Princeton University, 1959

Madame de Sévigné (1626-1696), in a voluminous correspondence addressed to a small group composed of her daughter, Madame de Grignan, her cousin, Bussy-Rabutin, and a few intimate acquaintances, touched on a wide variety of subjects. While her reputation as a great letter-writer is not challenged, this thesis will attempt to assess Madame de Sévigné's appreciation of literature and her capacity as a critic.

The first step in this task was to extract from Madame de Sévigné's letters all that she wrote on her readings, discussions of literature, attending the theatre and listening to sermons. The abundant and diversified material required a form of organization. The order presented here is: fictional literature in three categories, novelists, dramatists, poets, and the non-fiction as follows: historians-biographers-memorialists, philosophers-moralists, preachers and critics. All the comments on any given genre can then be seen across the years. There is also disclosed Madame de Sévigné's appreciation and evaluation of each single genre with the possibility of contrasting her preferences within the genres or in time.

Of 1,167 letters, 74 date before 1671, the year of the separation of Madame de Sévigné and her daughter. Beginning with that year the novelists received some attention but after the comments on Mme de la Fayette's *La Princesse de Clèves* in 1678, Madame de Sévigné put aside this genre. The theatre is represented by two authors, Corneille and Racine, the remarks appearing in the first two years of the correspondence and in 1689 during the production of *Esther*. For a more favored genre, poetry, there are some observations in each year of the letters. More important still were the historians-biographers, the philosophers-moralists and the preachers who, like the poets, consistently received some attention through all the correspondence. The least significant genre was criticism. A total of 10 remarks demonstrates Madame de Sévigné's indifference to theory.

The assessment of the comments as literary criticism is achieved by an analysis according to possible approaches in literary criticism but suggested by the comments themselves. Thus, Madame de Sévigné's frequent but brief references to works of literature are categorized as one-word criticism. Her statement that she re-read many authors is made sufficiently often to constitute another category. Likewise other categories are established on the basis of Madame de Sévigné's observations summed up in her use of the word "style", the claims "to understand" and "not to understand" certain authors, the many writers recommended for the education of her granddaughter, the presence in the letters of the "je ne sais

quoi", and associated with that phrase, "l'agrément", "le bon sens" and "le goût". Finally, though much less significant, Madame de Sévigné mentioned the "rules".

Whereas such a recognized scholar-critic as G.E.B. Saintsbury praised Madame de Sévigné for her insight and power as a critic the evidence proves otherwise. The high frequency of meaningless one-word criticism tends to minimize the value of all that remains. Brevity which is characteristic of these remaining observations creates in its turn the impression that the criticism was never intended as such.

To have favored Bourdaloue over Bossuet, to have been mistaken in her prediction that Racine would never go beyond *Andromaque*, to have failed to understand *La Princesse de Clèves* emphasize the lack of comprehension and insight.

Rather, the spontaneity of the remarks points to the reactions of an imaginative mind, one which always sought out, whether in the fictional literature or in the non-fiction, the story or that quality which stirred the emotions.

It can only be concluded that Madame de Sévigné commented on her readings as she commented on the news of the moment. Though she never was a critic, Madame de Sévigné was an intelligent reader who demonstrated some taste and an unflinching interest in her choice of reading.

Microfilm \$2.50; Xerox \$6.60. 136 pages.

THE DEVELOPMENT OF MECHANISM IN DESCARTES'S PSYCHOLOGY

(L. C. Card No. Mic 60-1055)

Paul Marie Bertrand Augst, Ph.D.
University of Colorado, 1959

Supervisors: Assistant Professor Vincent E. Bowen
Assistant Professor Forrest Williams

Descartes's psychology, which has received less attention than the other aspects of his works, may provide evidence of the importance of his ideas on the study of the "affections" of the soul in the seventeenth century. The object of this study is to bring out the origins and the development of two of the most distinctive features of Cartesian psychology: his theory of man as a machine, and the demonstration of the union of soul and body which makes it possible for this machine to have sensations, feelings and passions like real men. The first instance of Descartes's interest in the affections of the soul is found in his earliest "scientific" essay, the *Compendium musicae* (1618). From all the ideas borrowed from his predecessors, men of science and musical theorists, Descartes derived the notion that external objects act mechanically upon our senses.

This initial idea, the groundwork of Cartesian physics and physiology, was developed by successive steps into a coherent theory between 1619 and 1633, but his projected study of the universe, including man, was interrupted by Galileo's condemnation. Descartes turned his attention to metaphysics after the publication of the *Discours* while waiting for a more opportune moment to publish his "Physics," i.e., his system of the world.

After describing the two substances composing human

beings in *L'Homme* and in the *Méditations*, Descartes had to show how two substances so radically different were united, for it was evident that the soul was not merely juxtaposed to the body; if this were the case, we would not have any feelings at all. We have an immediate experience that feelings exist and that they are real because otherwise God would be deceiving us and this is inconceivable. We experience, however, that on many occasions feelings, and all the obscure and confused ideas resulting from the union of the two substances, deceive us and consequently can cause us great harm. In order to reach the maximum happiness which, with the search for wisdom, is the single end of our life in this world, we must know the nature of the obscure ideas which are apt to perturb the soul and destroy our happiness.

Descartes then decided to study the affections of the soul. In so doing, he constituted a new science and arrived at the conclusion that the human body functions in the best possible way considering our nature and our "situation" in this world. This is why all the passions of the soul are good in themselves and "nous n'avons rien à éviter que leurs mauvais usages or leurs excès." Analyzing the affections of the soul according to a "scientific" method, Descartes dissociated the science of the soul from ethics, thus opening a new avenue for the study of the human soul without any concern for the theological implications of these inquiries.

Descartes's psychology is original in that it is supported on the one hand by the metaphysical demonstration of the substantial union of soul and body, and on the other by the extension of the laws of mechanism to sentiment. He provided the moralists of the following generation with an empirical and objective method to study the affections of the soul without destroying the mysterious and incomprehensible nature of the "idées sensibles." This again represents a triumph of mechanism. Governing both the physiological and the psychological dimensions of man, mechanism allows the soul to maintain its integrity. It is designed to harmonize the soul and the body, allowing the best part of man, the soul, to exercise freely "toutes ses volontés." Microfilm \$5.30; Xerox \$18.70. 415 pages.

JOHN DRYDEN AND THE CHURCH OF ENGLAND: THE CONVERSION AND THE PROBLEM OF AUTHORITY IN THE SEVENTEENTH CENTURY.

(L. C. Card No. Mic 60-896)

Donald R. Benson, Ph.D.
University of Kansas, 1959

Professor Bredvold's work has led to a general recognition that Dryden's conversion from the Anglican Church to the Roman Catholic was a considered response to the questions of public and private authority which vexed his age, consistent with his basic intellectual attitudes. This study is a comprehensive re-examination of those basic attitudes and, in the light of this, of his motives for conversion. Dryden's views on the problem of authority are considered with particular reference to the teachings and practice of the Church of England in this matter during the period.

On the question of the authority of reason, the

seventeenth century Anglican Church on the whole maintained the traditional doctrine it had received from Richard Hooker. In the Restoration religious controversy, the traditional sufficiency of reason to apprehend natural moral law was not an issue nor, essentially, was the validity of discursive reason in general. However, the Jesuit attack on Scripture as a trustworthy source of revelation led some of the latitudinarian controversialists, the most articulate element in the Church, to exalt reason generally in a rational defense of Scripture and especially to exalt the traditionally secondary discursive function at the expense of the crucial intuitive function. Careful examination of all the evidence of Dryden's conception of reason (covering all his writings but the translations) reveals that he too accepted essentially the views of Hooker. He was by temperament both curious and undogmatic, and he therefore responded to most of the diverse revolutionary intellectual currents of his age: to the empiricism of the Royal Society, to philosophical skepticism, Hobbian materialism, enthusiasm and deistic and Socinian rationalism; yet his response to them all was either superficial or finally negative. Dryden formulated no system, not even an eclectic one, but rather accepted the central medieval Christian intellectual tradition without serious question and drew upon it as need arose. Evidence of this is plentiful. His critical writings, perhaps the best index to his mind, propose a view of the process, the means and the end of artistic creation firmly grounded in the traditional notions of reason and nature. His plays; his incidental comments on history, on natural moral law, on reason specifically; even his three explicit contributions to the religious controversy, *Religio Laici*, *The Hind and the Panther* and the answer to *Stillingfleet*, all reflect an essentially traditional conception of the capacity of reason. The important exception Dryden did express to Anglican teachings about reason was to what he regarded as excessive claims made for it by the latitudinarians in the mid-1680's, which he thought must lead to doctrinal divisions and ultimately to fragmentation of the Church.

On the problem of public religious and civil authority, which was at a level of crisis throughout the 1680's, though the Anglican Church preached the doctrine of passive obedience to established church and king, Dryden became increasingly doubtful about its ability to arrest the religious, and hence political ferment that was moving, both inside and outside it, especially after the king, its head, deserted it. The one crucial reservation Dryden had consistently made about the authority of reason was an essentially political one, and one which markedly reflects seventeenth century political experience, the distinction between private (and dependable) and public (and inflammatory) applications of reason. By the mid-1680's it appeared to him that only an assertion of spiritual infallibility against the private spirit in religion could preserve the nation from political chaos, and consequently spiritual destruction, and the Anglican Church would not make such an assertion. He therefore made his public testimony to the principle of religious infallibility by entering the Roman Catholic Church.

Microfilm \$4.90; Xerox \$12.85. 384 pages.

MATTHEW ARNOLD'S POETRY 1849-1855:
AN ACCOUNT OF THE CONTEMPORARY
CRITICISM AND ITS INFLUENCE.

(L. C. Card No. Mic 60-1060)

Roger Leon Brooks, Ph.D.
University of Colorado, 1959

Supervisor: Professor Leslie L. Lewis

The twofold purpose of this study has been to trace the growth of Matthew Arnold's literary reputation during the period 1849-1855 and to show the extent to which the criticism of the readers and reviewers influenced the writing of his poetry.

From 1849 to 1855, Arnold published *The Strayed Reveller, and Other Poems* (1849); *Empedocles on Etna, and Other Poems* (1852); *Poems* (1853); *Poems* (1854); and *Poems, Second Series* (1855). These five volumes were, for the most part, the ones to establish Arnold's reputation as a poet.

The extant copies of Arnold's poetry with dated inscriptions, Arnold's published and unpublished letters, his unpublished notebooks, the recorded comments in published and unpublished correspondence, diaries, biographies, and autobiographies of his contemporaries reveal that Arnold's readers were greater in number than the traditional "few" that literary historians have allotted to him. However, from the publication of *The Strayed Reveller, and Other Poems*, these readers proved to be an esoteric group, limited, for the most part, to family friends and relatives, the "Wordsworth Circle," literary circles in several countries, students at Rugby, Eton, Oxford, and Cambridge, and the young men of his own generation who had recently emerged from the universities. Although his readers increased markedly after the publication of *Poems* (1853), this classification of readers is valid for the five volumes under consideration.

The extant comments of contemporaries and the sixty reviews (twenty-nine unrecorded) used in this study reveal that Arnold's five volumes of poetry were more widely read and reviewed than heretofore believed, and that each volume, contrary to the accepted opinion, was, on the whole, favorably received.

During the seven years in which his first five volumes appeared, Arnold's correspondence reveals a sensitivity to and response to the criticism of the readers and reviewers of his poetry. The correlation between the suppressed poems and those censored, between the revisions and passages unfavorably criticized is such that the influence of the readers and reviewers cannot be denied.

This study indicated that Matthew Arnold's early poetry had more readers and reviewers and was more favorably received than Arnold students have hitherto believed. It indicates, also, that Arnold suppressed and revised his poetry according to the criticism he received from his readers and reviewers.

Microfilm \$2.50; Xerox \$8.40. 183 pages.

ANDRÉ BRETON: ARBITER OF SURREALISM.

(L. C. Card No. Mic 60-1132)

Clifford H. Browder, Ph.D.
Columbia University, 1959

Supervisor: Professor Jean Hytier

There have been many French studies of André Breton's intellectual and artistic concepts, but few have dealt at length with the later phases of his career, considered him as a writer, or fully probed the complexities of his ideas. These ideas generally have been sympathetically received and expounded, or belligerently rejected; the few studies that have undertaken a lucid critical analysis have not been comprehensive. As a result, certain contradictions and ambiguities have been overlooked, and the richness and profundity of his concept of Surrealism not fully appreciated.

This dissertation attempts to present Breton's ideas in all their fullness and subtlety, and to analyze them critically. So doing, it seeks to gauge the significance of Breton the man and the writer, and at the same time to evaluate the basic theories of Surrealism, to the advancement of which he has given his life. Breton's long career and the history of Surrealism are reviewed, so as to emphasize the impact of his personality and the fundamental consistency of his position, while indicating the different phases of his intellectual evolution. Breton's Dadaist and Surrealist attitudes of revolt are examined, as well as the influences that have helped to shape them (Vaché, Lautréamont, Freud, etc.). His notion of Surrealism, too often oversimplified by critics, is found to include varying and even conflicting aspirations that may properly be termed scientific and mystical, and furthermore to propose, not a blind surrender to the irrational, as has been charged, but rather a conquest of the irrational by a continually-expanding rational consciousness. There is evidence of an abiding hesitation on his part concerning the nature of the surréal, which he may present as an objective or subjective, transcendent or immanent, phenomenon. His reaffirmations of a philosophy of immanence consistent with atheistic materialism are often belied by a metaphysical and even mystical vocabulary.

Breton's attempts to realize Surrealism's scientific ambitions—notably in the practice of verbal automatism—are judged altogether unconvincing, and his efforts to find political expression in Marxism are similarly seen as futile from the outset. His Surrealist aspiration realizes itself more happily in the cult of daily adventure (coincidences, premonitions, discoveries, etc.) and in the supreme revelation of love, though Breton's later elaboration of arbitrary personal myths cannot be taken seriously. His still later occultist phase is basically a restatement in esoteric terms of Surrealism's pursuit of mental magic and its utopian hopes for mankind.

Breton is also considered as a theorist of humor and as a writer. No formal stylistic study is undertaken, but a general survey suggests that he is an indifferent poet and a masterful prose rhetorician.

In conclusion, Breton and Surrealism are seen as in almost all respects inseparable. Breton's ideas are rich, complex, and adaptable, but retain an organic unity throughout. Being neither a science nor a religion, his movement must be considered as literature and art. But if Surrealism is art, the concept of art has through Surrealism been

enriched and expanded, so that Breton's ideas have had a considerable influence on his time. It is as a theorist and prose writer, as well as a personality of great force and charm, that Breton commands respect and attention.

Microfilm \$6.20; Xerox \$21.85. 485 pages.

THE CONCEPT OF LOVE IN THE MAXIMS OF
LA ROCHEFOUCAULD

(L. C. Card No. Mic 59-3787)

May Wendelene Butrick, Ph.D.
State University of Iowa, 1959

Chairman: Assistant Professor C. G. Christofides

This dissertation defines love as it is treated in the Maxims of La Rochefoucauld, distinguishes between the several forms of love recognized by the author, analyzes these forms, and examines various aspects of them. No adequate analysis had been made of this concept, largely because the whole ideology of the author has been obscured in the debate concerning amour-propre; only those maxims which contribute directly to this theme have aroused much interest. Other maxims which should have pointed immediately to the author's larger and richer conception of love have simply been ignored, or mentioned as contradictory to the central theme, or even misconstrued in a conscious or unconscious attempt to erase the disturbing element. Upon careful analysis of the text, the disparate elements take the shape of a more meaningful whole within which one distinguishes several categories of love.

The limits of our subject were established by the treatment given the concept in the Maxims and also by a preliminary definition destined to eliminate semantic confusion of love as it exists between two human beings with "love" of non-physical entities, inanimate objects, etc. We define love as forces of attraction which are activated between two individuals. La Rochefoucauld's statements center around that involving opposite sexes, in which case a physiological attraction is basic.

At the beginning of the textual analysis we show that in La Rochefoucauld's one attempt to define love, he recognizes different forms. These distinctions are preserved in the organization of our dissertation. First, we discuss two forms of love which may masquerade as le véritable amour and are easily confused with it, but which are of different nature and origin: physical desire and pure amour-propre.

The most important section of the dissertation then deals with various aspects of true love as something surpassing these facsimiles. It is shown to be determined by the same factors as other human passions: physiological structure, temperamental make-up, and egotistical drive. Two particular applications of the author's deterministic view are his analysis of the coquetry of feminine temperament and the folly evident in all amorous behavior.

It becomes apparent that true love cannot exclude egotistical involvement; everything which is done voluntarily is necessarily self-motivated and self-satisfying. However, in true love a maximum of egotistical energy is expended upon the beloved and a minimum is conserved for the preservation and pleasure of self. Self-renunciation

itself may become a pleasure to one who has found happiness in the act of loving. In addition to purity from completely "interested" motives, La Rochefoucauld considers intensity, depth and duration of love as other criteria of its trueness. The evolution of love, the birth of jealousy and hate, and the decline of love are discussed.

True friendship follows the discussion of true love. Friendship is compared with love, then contrasted to it by virtue of its intellectual origin and nature, and its insistence upon mutual independence and reserve.

During the course of his vigorous life, La Rochefoucauld had an opportunity to observe and experience most of the aspects of love which he describes. However, if he ever knew *le véritable amour*, it is apparent that his happiness was cut short and his outlook embittered by the lady's infidelity. We conclude that it was this experience which caused him to deny ever having felt true love, and to judge friendship to be more satisfying and more worthwhile.

Microfilm \$2.75; Xerox \$9.70. 211 pages.

THIS COLOSSAL THEATER: THE UNITED STATES INTERPRETED BY JOSE MARTI.

(L. C. Card No. Mic 60-644)

Roberta Day Corbitt, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Alberta Wilson Server

Martí's fourteen volumes of *North American Scenes* are all but unknown in the United States, the place where they are of most significance. The year 1953, the centenary of his birth, called forth in renewed vigor the enthusiasm of his admirers in his America, but sixty years after his death his name is still that of a stranger in this country. This fact was made public by the committee established to celebrate the centenary, and the result was the publication of four books in English.

The seventy-four volumes of his works, as published in the most recent edition, offer countless possibilities for studies of varied character. In this paper he has been presented as a writer of North American customs. His style has been portrayed in numerous quotations whose original Spanish always excels. An effort has been made to sample the pictures he has left of every phase of North American life with which he dealt--politics, which was his chief interest; society, with its social and labor problems, including the "colossal" one of the immigrants that has changed the face of this country more than even the passing of time with its progress and decay; the place of amusements in this busy nation, the training of its youth and the part played by its women in the role of citizens; and the reflection of its soul in the kind of worship that springs from it.

The comparisons that Martí has drawn between his Latin race and this Anglo-Saxon foundation upon which the nations of the world have built, if read thoughtfully and with an open mind, should provoke self-analysis in North Americans. Sometimes his criticisms seem harsh and biased but an observer cannot reject them. The accusation of too much generalization and inconsistency has been launched against the author of the *Scenes*, and he has been

charged with being ignorant of the great expanse of this nation that lies west of the Atlantic seaboard, although his *cuadros*, drawn from careful study of the newspapers of the country, are full of interest.

Gleanings from the enormous body of Martí's epigrams and proverbs have been used freely, because even as a depicter of customs he never failed to draw a moral, and often to carry its elaboration throughout many pages or entire articles. For this reason, partly, was he called "el Maestro."

This study is prefaced with a brief sketch of Martí's very active life with its stormy youth, its saddened maturity and its tragic prime. Very little has been said of his services to his native Cuba, the greatest contribution of his life, or of his leadership and organization of the revolutionary effort that severed Cuba from her mother, Spain.

The greatness of Martí's soul is seen in his words and in his deeds, and if there is a difference of values or a disagreement with his evaluation, the disadvantage lies with the author of these words and not with Martí, who has proved himself to the world.

Microfilm \$2.80; Xerox \$9.70. 213 pages.

HEDONISM AND THE CONCEPT OF NATURE: THE WORK OF RABELAIS AND MONTAIGNE IN THE CONTEXT OF WESTERN LITERATURE.

(L. C. Card No. Mic 60-1136)

Stanley G. Eskin, Ph.D.
Columbia University, 1959

This dissertation investigates those aspects of the work of Rabelais and Montaigne which reveal (1) a certain kind of hedonism; (2) an indulgent, favorable or even enthusiastic attitude toward sensual experience; (3) a concern with basic human appetites and instincts; (4) a particular concept of "nature" which underlies and informs all of the above attitudes. The dissertation adopts both an analytical and a historical approach to these subjects. The analytical approach involves a close study of the text of Rabelais and Montaigne. The historical approach is concerned with relating Rabelais and Montaigne to other works in Western literature and philosophy which, in one way or another, reflect points of view analogous to those of the two French writers. Montaigne is considered as explaining and justifying in forthright, expository terms certain attitudes presented implicitly and imaginatively by Rabelais.

In Rabelais, particular emphasis is put on his concept of joy, his ideas on education, the principles underlying the Abbaye de Thélème, the philosophy of "Pantagruelism," his concern with the physical appetites, his realistic attitude toward sex, his concept of nature and antinature (Physis and Antiphysie), and the symbolic implications of wine and drinking. In Montaigne, special consideration is given to the highly personal nature of his hedonism, his relationship to classical Epicureanism, the relationship between his hedonistic and skeptical tendencies, his attitude toward appetites and instincts (with close consideration of his attitude toward sex), his conflicting attitudes toward nature, and his ideas on the relationship between nature, reason and God.

The dissertation attempts to relate these aspects of

the thought of Rabelais and Montaigne to various trends in intellectual history and to define these trends by reference to specific works exemplifying them. The concept of pleasure and the relationship between pleasure and sensuality are discussed, with reference to Plato, Aristotle, the Epicureans, the Cyrenaics, Thomas Aquinas, Thomas More, Erasmus and others. The background of some of Rabelais's ideas in medical literature is considered. The realistic attitude toward love which develops in the middle ages and continues throughout the Renaissance is discussed, with reference to the *Roman de la rose*, Boccaccio, Chaucer, Aretino, Marguerite de Navarre and others. The complex background of the idea of nature is discussed, and an attempt is made to relate Rabelais's and Montaigne's "naturalism" to this background. Particular attention is paid to Stoicism, to Cynicism, to the concept of natural law in Hooker and Agrippa, and to the allegorical tradition of personifying nature in Alanus de Insulis, Jean de Meung, Chaucer and others. A special section is devoted to Valla's *De voluptate* as an example in the early Renaissance of an attitude toward nature and pleasure in many ways close to that of Rabelais and Montaigne.

Most of this background material is incorporated into the specific discussions of Rabelais and Montaigne to which it is relevant. In conclusion, a concept is proposed of two general, antithetical tendencies in Western cultural history: a tendency to restrict or repress the sensual attributes and natural instincts of man, and a counter-tendency to liberate them. These two trends are discussed briefly in relation to the literature and philosophy of classical antiquity, the Middle Ages and the Renaissance. Particular attention is paid to the "restricting" attitude of the Christian tradition, with reference to St. Paul, to the Church Fathers, to Thomas Aquinas and to Calvin. A brief survey is then made of the kind of reaction which this "restricting" attitude engendered among various medieval and Renaissance writers, producing a "liberating" tradition of which Rabelais and Montaigne are perhaps the most important exponents. Microfilm \$3.80; Xerox \$13.50. 296 pages.

THE PATTERNS OF JANE AUSTEN'S NOVELS

(L. C. Card No. Mic 60-656)

Donald Raymond Fryxell, Ph.D.
University of Kentucky, 1953

This work studies the relationships of the incidents, characters, and ideas in each of Jane Austen's novels to the pattern which controls the design of the whole. Because the terminology available for such an analysis may be ambiguous, *pattern* is defined in the first chapter. The six completed novels are then examined in detail according to the principles set forth, and the conclusions which may be made are drawn together in the final chapter.

The emphasis in this study is on analysing the individual novels. These analyses reveal that Miss Austen's art fails more frequently than is commonly supposed, but they support the common observation that *Pride and Prejudice* and *Emma* are among the best constructed novels in the English language. The analyses show further that *Northanger Abbey* is a better novel and *Persuasion* a somewhat poorer one than is generally thought, that the pattern of

Sense and Sensibility is the most mechanical of any of the six novels, and that the structure of *Mansfield Park* breaks down in the last third of the novel.

This study shows that Miss Austen's novels are essentially dramatic and that a five-act structure is discernible in all six. However, instances are pointed out in which Miss Austen's dramatic sense fails her. One explanation for her shortcomings is found in her reliance upon the conventions of the sentimental and the Gothic novel, but even more important, the probability and the inevitability of the action, as well as character consistency, suffer as a result of her concern with her theme. Miss Austen was a humorist, a realist, a satirist, and a moralist. Her best novels are those in which the satirist and the humorist predominate; the artist and the realist control the pattern then, and the moralist is subdued, though not conquered. Her poorest novels--*Sense and Sensibility*, *Persuasion*, and *Mansfield Park*--are those in which the moralist takes charge and subordinates artistic principles to the didactic intention.

The analyses show that the intellectual content of Miss Austen's novels, although not great, is at least significant and consistent. The pattern of all six is concerned in part with showing the way in which at least one character gains self-knowledge, but certain recurring ideas--particularly the importance of self-control, rational judgment, common-sense actions, kindness and consideration toward others--form an essential part of the patterns of the novels.

Microfilm \$4.05; Xerox \$14.20. 315 pages.

EDWIN ARLINGTON ROBINSON AS DRAMATIST AND DRAMATIC POET

(L. C. Card No. Mic 60-657)

Lucy Dickinson Fryxell, Ph.D.
University of Kentucky, 1955

Supervisor: Dr. Herman E. Spivey

This dissertation undertakes to show the extent of E. A. Robinson's interest in the theater and in playwriting, to analyze his published plays, and to demonstrate the influence which his experience had upon his later long narrative poems.

All his adult life Robinson was interested in plays and in the theater; his letters reveal his appreciation of the dramas, as well as his critical judgment. In New York in 1904 Robinson became friends with William Vaughn Moody, Percy MacKaye, and Ridgely Torrence, three ambitious young playwrights whose enthusiasm inspired him to try writing for the stage. Again and again between 1904 and 1914 Robinson tried to write produceable plays, but in spite of his friends' aid and encouragement, he could not find a producer. Eventually he turned back to poetry, feeling that in this medium there was chance for a movement of light and shade, that the obliqueness that is possible in poetry was better suited to his talents than was the directness demanded in a play.

Robinson's two published plays reveal that he did master certain of the techniques of stagecraft; but sometimes he is oversubtle, and sometimes, as if aware of this tendency, he goes to the other extreme of making his

preparation or his theme too obvious. The plays have faults, but they also have something significant to say to anyone studying Robinson's methods in the narrative poems. In turning back to poetry, Robinson did not altogether discard the dramatic techniques that he had worked out in the plays; moreover, although the narrative poems on the whole are superior, the plays have few faults that one can not find present to some degree in the later narratives.

In the long poems, unhampered by the restrictions of the stage, Robinson was better able to portray subtle nuances of tone, and he could present his characters partially through analysis, rather than entirely through their words and actions; but although he was able thus to broaden the range of his effects, he kept those aspects of playwriting that appealed to him. In the Arthurian poems, for which he takes his basic plots ready made, he so selects and delimits the material that any one of the poems, without major changes, could be made into the scenario of a play. In both these and the modern poems Robinson limits not only the scope of his action, but also the number of characters and settings. He selects the high points of the action and expands them into dramatized scenes which progress primarily through dialogue; subordinate and background action is also revealed through the conversation of the characters. Moreover, these scenes usually fall into the pattern of acts of a play, ranging from the modern three-act structure of *Talifer* to the five-act structure of *Lancelot*.

Robinson's early short poems have qualities frequently referred to as dramatic, but none that he wrote before 1904 shows any awareness of play structure. *Captain Craig*, for instance, the only long poem before that date, employs a narrator and progresses in part through a series of letters.

As a result of his interest in the stage, Robinson did not become merely a playwright in verse; but when he undertook a long narrative poem, he went about working out the sequence of events, as he once said, like the scenario of a play, and he used a number of devices that are part of the playwright's stock in trade. It seems apparent, then, that Robinson's interest in the theater and the years he spent trying to write for the stage constitute a significant part of his development as a dramatic poet.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

VIRGINIA WOOLF AND THE ART OF CRITICISM

(L. C. Card No. Mic 60-924)

Morris Irving Goldman, Ph.D.
University of Minnesota, 1959

Any study of Virginia Woolf's criticism must begin by pointing to the striking contrast between her high status as a novelist and her relatively low reputation as a literary critic. The disparity may be due to the misleading statements by various commentators on her literary criticism. Their estimate of her position, however, deprives us of the real value of her criticism.

It is the purpose of this study to reveal an over-all design in the essays. Since most of Mrs. Woolf's essays are fugitive pieces or were originally reviews, it is necessary to approach the subject inductively, to trace certain

dominant themes that will reveal an underlying form or controlling aesthetic in her criticism.

In the first part of this study, the essays are arranged in historical order, so that Mrs. Woolf's experimental interests may be traced against a traditional framework. Mrs. Woolf's conception of reality and of the modern sensibility led to her concern with literary forms. The essays on literary form are analyzed in Part Two. Here again, the essays are arranged in historical sequence, so that her idea of reality leads to the question of form in the novel. Mrs. Woolf tried to incorporate or reconcile traditional literary forms with her experimental fiction.

The third part of this study is devoted to the so-called biographical essays. Her critical interest in biography is to be associated with the questions of art and reality raised in the first two sections. Her persistent interest in biography or personality is of course related to her work as a novelist.

Part Four deals with Mrs. Woolf's own theories of the nature and function of criticism and the critic. Though Mrs. Woolf assumed the role of "common reader," it is soon evident that her own essays on reading transform the common reader into a serious critic. This section attempts to provide a necessary corrective to the repeated reference to Mrs. Woolf as an impressionist critic. She is presented as a critic whose method is a much-needed middle ground between the extremes of what T. S. Eliot has termed "appreciation" and "understanding".

Microfilm \$6.00; Xerox \$21.20. 470 pages.

THE UNTUNING OF THE SKY: STUDIES IN THE SPECULATIVE MUSIC OF ENGLISH POETRY, 1500-1700.

(L. C. Card No. Mic 60-824)

John Hollander, Ph.D.
Indiana University, 1959

The power of music to affect the feelings of a listener, the relation of music to poetry and the mathematical structures giving order to the musical systems of Western culture have come under the eye of general philosophic speculation from Classical times on. During the course of the Middle Ages, learned and popular views of the nature of music were elaborated and codified under the name of *musica speculativa*, as opposed to the study of actual singing, playing and composition ("practical music"). Ideas of speculative music, transmitted by such early Medieval writers as Boethius and Cassiodorus and afterwards widely disseminated, involved certain Classical notions which came to be deformed somewhat under the pressure of changing realities of musical practice.

A flowering of sacred and secular music in the Renaissance was accompanied by a spread of musical thought: traditional questions of music's powers to move or organize the soul, the nature of musical and universal harmony, the uses and properties of musical instruments and the interdependence of music and poetry became themes for general learned and intellectual discussion. Moreover, both "practical" and "speculative" music came to serve first as the subject matter for didactic and discursive poetry and eventually, at the end of the sixteenth century,

as the source of imagery and sub-theme in lyric and dramatic poetry as well. The present dissertation studies the use of musical subjects, themes and images in the English poetry of the sixteenth and seventeenth centuries. Against a background of changing musical practices, theoretical systems and broader speculative beliefs, it is demonstrated that changes in poetic conventions also helped to bring about a shift in the literary significance of music during the course of the seventeenth century. In general, this shift is seen as dislocating ideas of music's affective power from their earlier place in a larger musical and cosmological world-view, and as gradually emptying many old musical myths and doctrines of whatever belief previous centuries may have invested in them.

After a brief analytical and historical introduction to theories of music's nature, power and relation to poetry from Classical times through the Renaissance, a gradual decline in the significance of music's role in the universe is traced through Classical and Christian theories. Phases of this change are then plotted in successive chapters as follows: The history of musical materials as sources for set subjects and occasional imagery in English poetry through the end of the sixteenth century; The reflection in poetry of the musical esthetics of the early Baroque era; the imagery of private and public devotional music in seventeenth-century meditative poetry; and the decay of the significance of musical myths and figures into mere literary conventions from about 1640 on. Detailed examinations of poems and passages of Shakespeare, Crashaw, Herbert, Marvell, Milton, Cowley and Dryden conclude the synopses of minor poems and general literary-historical surveys in successive chapters.

Microfilm \$6.15; Xerox \$21.85. 484 pages.

DETERMINISM IN THE NOVELS OF GEORGE ELIOT

(L. C. Card No. Mic 60-935)

George Lewis Levine, Ph.D.
University of Minnesota, 1959

George Eliot is one of the first English novelists consciously to assimilate into her novels a belief that every event is determined by a causal antecedent. But her determinism was not merely the result of abstract thinking, and it did not, despite arguments of many critics, lead her away from experience. Her acquaintance in childhood with the doctrines of Calvinism, with the stoicism of peasants near whom she grew up, and her deepening impressions of the slow development of social and natural life, shaped her view. Reading Spinoza, Comte, Mill, and Spencer helped her to formulate her beliefs systematically, but it did not create them.

Determinism entailed for George Eliot certain important beliefs, all of which became important in the novels. For instance, she believed that nothing happens by chance or miracle and that anyone who puts his faith in them is immoral; that deeds breed effects (and other deeds) after their kind so that means cannot possibly be justified by ends; that every action is greatly determined by environmental, psychological, and hereditary causes; that the world is a marvelously complex unit whose parts are in-

tricately inter-related; that in such a world the insignificant can take on importance and the heroic is almost impossible; that Duty is primary because every act, however insignificant, may have serious unforeseen effects. But determinism did not entail for her a belief in the powerlessness of the will. She believed that all actions are caused, but very few are compelled; and in most cases the doer is one of the important causes. Her novels, therefore, are not pessimistic in the way Hardy's are. They emphasize, rather, the difficulty of making choices, not the impossibility of making any that matter.

Combined with her deep moral concerns and the moral aesthetic she inherited--in part from the Romantics--her determinism helped to give her novels their peculiar form and qualities. And although one might account for many of their main characteristics by approaching them from another direction (for example, by viewing their relation to earlier developments in the novel, or by considering the influence of her early evangelicalism on her mature beliefs), all of them--and especially the peculiarly modern ones--are clearly related to determinism.

For example, believing in "environmental causes," George Eliot anticipated the naturalistic novel by filling in the context of all her stories with long and close analyses of the societies in which they take place. Her interest in "psychological causes" led her to investigate with greater care than any earlier English novelist the workings of the minds of her characters, and thus to anticipate the psychological novel. Moreover, because of her awareness of the complexity of causes, she broke away from the tradition of "humorous" characters by handling almost all of her important figures, no matter how apparently villainous, in the round and sympathetically. Recognizing as well the difficulty of choosing, she emphasized in a manner that foreshadows the work of such a novelist as Henry James, the crucial moment of choice in each of her characters' lives. Determinism can account also for her persistently realistic techniques, for her constant development of the theme of egoism as opposed to fellow-feeling, of the continuity of past, present, and future, of the importance of man's relations to his ancestors, family, and society, of resignation, and of understanding the laws of nature and society. Microfilm \$4.30; Xerox \$15.10. 333 pages.

THE POETRY OF TRISTAN CORBIÈRE

(L. C. Card No. Mic 60-1147)

Marshall Lindsay, Ph.D.
Columbia University, 1959

Little is known about the life of Tristan Corbière. What seems to have had the greatest influence on his poetry were his father, the severe attacks of rheumatism he suffered, eight years of solitary life on the Breton coast, his love for the woman he called Marcelle, a few years spent in Paris, and the ever-present threat of death. Corbière's poems are full of his physical ugliness, his failure, and his revolt against and exile from mankind. His biographers considered Corbière's eccentricities to be a mask to hide his suffering. More recently biographers have interpreted his life as a revolt against his father and everything representing paternal authority.

Although Corbière's *Les Amours jaunes* was published in 1873, his name and his poetry remained almost entirely unknown until 1883, when Verlaine wrote about him as a *poète maudit*. But critics have never accorded to Corbière the attention and acclaim they have to the other *poètes maudits*. The strength of his verse and his occasional lyricism were admired, but his mannerisms, conceits, and lack of aesthetic principles were thought to spoil the total effect of *Les Amours jaunes*. For many years Corbière was praised as a superb regional poet and as a precursor of symbolism. Today there is an increasing interest in the poems about love and death.

The themes of *Les Amours jaunes* are themes that were characteristic of romantic poetry, but Corbière's attitude was a critical one: he sought to destroy romantic illusions by describing his experience without interpretation or exaggeration. Ultimately, his themes were concerned with life and death; Brittany, the sea, and love became affirmations of life in Corbière's struggle against death.

An important theme in *Les Amours jaunes* is one describing Corbière's theory of criticism and aesthetics. He disapproved of both romantic and Parnassian poets, feeling that their preoccupation with form had weakened the vitality of their emotions. In his regional poems, Corbière asserted that reality is inherently poetic and that any embellishment would destroy its beauty. Later, in the poems about love and death, when his subject matter had shifted from exterior to interior reality, Corbière's aesthetics evolved, under the influence of Baudelaire, towards a more subtle conception of poetic beauty.

Corbière's versification has frequently been criticized for its irregularity. His use of syncopes and apocopes, his counting of diphthongs, the licenses he took with caesuras, enjambments, rhymes, and alternation of rhymes were highly unusual. But in as much as he respected the principles of counted syllables and of rhyme, his versification was not revolutionary. Although the sound of his lines is neither musical nor harmonious, Corbière did use repetitions of words and sounds for special effects of rhythm to support his meaning.

It is the coherence of Corbière's emotions that gives his poems their aesthetic unity, for they lack formal or logical organization. His poems communicate complex emotions primarily by means of verbal analogy and irony. The irony is of particular historical interest as Corbière was the first serious lyric poet in France since Villon to use an abundance of humorous irony and wit. It was his ironic attitude that permitted Corbière to stand apart from his emotions and that made possible his lucid analyses of them.

Microfilm \$3.35; Xerox \$11.70. 257 pages.

GEORGE GISSING: NOVELIST.

(L. C. Card No. Mic 60-936)

Raymond Gates Malbone, Ph.D.
University of Minnesota, 1959

George Gissing (1857-1903) is remembered chiefly for one travel book, *By the Ionian Sea*, and one volume of belles-lettres, *The Private Papers of Henry Ryecroft*. He

wrote twenty-two novels, but his reputation as a novelist has suffered because many reviewers and literary historians have been more interested in Gissing's life than in his novels, and because many critics have dismissed his novels either as overburdened with the conventions of the mid-Victorian three-decker or as merely the projection of a personal grudge. A critical analysis of five of his best novels, however, shows that Gissing was a serious and able novelist and that he deserves to be remembered as such. In form and theme *Thyrza*, *The Nether World*, *New Grub Street*, *In the Year of Jubilee*, and *The Whirlpool* all have the interest and unity which intelligent modern readers value in novels and which modern critics expect in any work of art.

Gissing experimented with other types of novels, but in the general pattern of his best work he combined a broad view of society with a detailed analysis of the inner lives of a few characters. In scope and in the handling of authorial comment Gissing's novels are similar to those of his mid-Victorian predecessors, but his major novels show no evidence that he was burdened by the conventions of the three-decker novel. Gissing was interested in social problems, and they are important in many of his novels, but he believed in the novel for the novel's sake and never wrote thesis novels.

Though some novels such as *The Nether World* contain naturalistic elements, Gissing's belief in artistic sincerity, in not presenting an exaggerated view of any aspect of life, and his acceptance of limitations on the subjects with which a novelist could candidly deal, kept him from being a naturalist. In most of his novels Gissing gave careful attention to the details of everyday life, but Gissing was never satisfied to present merely the so-called objective view of life which is associated with modern realism. He believed that as an artist it was his duty to present sincerely his own view of life. His exposure of the evils of modern civilization, however, cannot be dismissed as the projection of a personal grudge. Gissing's attitudes are evident in the tone of his novels, but he never gives preferential treatment to characters that hold views similar to his, and he is scrupulously fair in presenting characters whose views are opposed to his own.

There is much unevenness in Gissing's novels taken as a whole, but his best work is very good, and he wrote two novels that are among the best written in English in the nineteenth century--*New Grub Street* and *The Whirlpool*.

(Appended to this dissertation is an extensive bibliography of works by and about George Gissing which corrects errors in previous bibliographies and is more nearly complete than any which has been published.)

Microfilm \$2.50; Xerox \$8.20. 177 pages.

HERMAN MELVILLE IN GERMAN CRITICISM FROM 1900 TO 1955

(L. C. Card No. Mic 60-1281)

Charlotte Weiss Mangold, Ph.D.
University of Maryland, 1959

Supervisors: Professor A. E. Zucker
Assistant Professor L. Lutwack

The purpose of this study is to trace the development of Melville criticism in Germany from the years 1900 to 1955. It does not aim, however, to present only a consecutive narrative of what the German critics have written about Melville and his fiction, but also to indicate the relationship of German criticism to the political, social and economic developments of the four periods in which Melville is discussed in this paper.

To the best of our knowledge, Melville was completely ignored in German criticism during the first quarter of the twentieth century. He appeared for the first time in the critical reviews of the late 1920's when Thomas Mann, editor of a literary project entitled "*Romane der Welt*," and his collaborator, Herman G. Scheffauer, introduced German translations of Melville's books, *Typee*, *Omoo* and *Moby Dick* to German readers. Unfortunately, for Melville, the critics were not in accord with Mann's aspirations to promote foreign fiction in Germany and their strictures concerning his project prevented Mann from broadening "the spiritual horizons" of the German people. Melville was caught in the crosscurrents of these animosities and for this reason was unable to gain a strong foothold in German critical circles. Fortunately, however, his undeserved obscurity, during the first phase of his development in Germany, was not projected over his future reputation in this country.

In the early 1930's little of a critical nature appeared on Melville. Two notable scholars of this period, Professor Schönmann in Berlin and Professor Lüdeke in Switzerland directed outstanding doctoral dissertations on Melville. During the period of National Socialism interest in Melville mounted steadily despite a so-called "conditional censorship" which was placed upon *Billy Budd* and "*Benito Cereno*," two stories which were eminently popular at this time. No attempt was made to relate Melville directly to the political ideology of this era although the critics made several references to the concept of *Heldentum* in Melville's stories, a term frequently used by the Nazi propagandists. During the war years, Melville was kept alive by the German translation of Jean Giono's fictionalized version of Melville's life, *Melville zum Gruss*.

Ironically the vitality of Melville came when the German mind and spirit were exhausted from the effects of the war. From 1945 to 1949, a whole new era of Melville criticism was produced in Germany. Finding life around them without hope and living at a time of disillusionment and cultural decay, the critics were looking for fiction that would express the tragedy and pessimism of their time. These attitudes they found in *Moby Dick*, the first Melville translation to appear after the war. Melville's success in Germany at this time was also contemporaneous with the so-called "American Movement." The close of the war brought with it a large surge of American books into Germany. There is no doubt that this factor also aided Mel-

ville's popularity. The most significant aspect of his rise in reputation is not merely in the increased numbers of reviews and articles, but in the attitudes which German critics took in regard to the author of *Moby Dick*.

Melville criticism from 1950 to 1955 changes in several essential ways. Melville is no longer associated with the problems of the moral and cultural break-up of a war-torn society. He now acts as a reviving agent for German criticism. With the steady influx of new books from abroad and with the general betterment of social and economic conditions, the critics took another view of Melville's fiction. He is looked upon as a "modern" author linked with such writers as W. H. Auden, T. S. Eliot, and Franz Kafka. In addition, Melville's stories were more carefully scrutinized than in the previous periods. Critics were eager to explore his "modern" potentialities. Not only is Melville's *Weltanschauung* stressed, but his inclusion of humor in several of his works was a topic of importance to several scholars and critics.

In conclusion, it is significant to mention the one distinctive feature which marked German criticism on Melville since its early beginnings. Many of the outstanding reviews and essays discussed in this paper are conspicuous for detecting the metaphysical overtones in Melville's fiction. This attitude is particularly prevalent during the last two periods of Melville's development in Germany. The interest shown by the critics in Melville's philosophy is, however, first discernible in the late 1920's in the preface to the German *Typee*. The editor here declares the book to be enveloped in "a world of metaphysics." During the aftermath of the war, a period in which the critics were searching for a new understanding of human existence, several of the commentators appraised the works of Melville on "existential" grounds. Melville is frequently mentioned in connection with Kafka and Kierkegaard. This period from 1945 to 1949 paved the way for a greater concentration on and interest in Melville's *Weltanschauung*. How seriously the critics discussed the metaphysical and moral strain in Melville can be seen from the number and kind of essays written during the years from 1950 to 1955. The critics at this time proclaim the influence of Schopenhauer on Melville's thought, remark upon his Platonic concepts in *Billy Budd* and stress his "transcendental" qualities. In short, it would not be an exaggeration to say that Melville as a "brooding and irresolute moralist" made his greatest contribution to German critical thought by his tireless and courageous concern with "a quest that is the prerogative of no single nation but of every sensitive individual--the search for the rediscovery of that innocence in the human soul of which contact with worldly experience has deprived it."

Microfilm \$5.35; Xerox \$18.90. 417 pages.

**FEMALE CHARACTERS IN THE NOVELS OF
JOSE RUBEN ROMERO AND
GREGORIO LOPEZ Y FUENTES:
A COMPARATIVE STUDY.**

(L. C. Card No. Mic 60-862)

James Cuthbert McKegney, Ph.D.
University of Washington, 1959

In this dissertation the author has made a detailed study of the role of female characters in the novels of José Rubén Romero and Gregorio López y Fuentes, two Mexican novelists who have flourished in the second quarter of the twentieth century. Seven novels and a biographical essay by Romero, and ten novels by López y Fuentes have been studied, in an attempt to discern the similarities and differences which exist in the treatment of women in their works. There is a summary of the novels of each writer, followed by a study of the way in which he develops the female characters in each of his novels. Both of these men were intimately involved in the Mexican Revolution, and this fact is clearly indicated in most of their works. Their description of the reaction of women to the events of the Revolution is discussed, and there is a discussion also of the way in which women suffer as the result of oppression by landowners and unscrupulous politicians.

The conclusion is that both novelists regard with deep sympathy and understanding the plight of women in communities which suffer either from the Revolution or from tyrannical landowners, or from both. Neither writer considers city life to be conducive to happiness or a high standard of morality, in women, both preferring the life of the country or of small communities. While both Romero and López y Fuentes portray women convincingly, there is a greater warmth and sympathy in Romero's portrayal, and he presents a greater number of memorable female characters than does López y Fuentes.

Microfilm \$7.60; Xerox \$27.00. 600 pages.

**WILLA CATHER'S SEARCH FOR VALUE:
A CRITICAL AND HISTORICAL STUDY
OF HER FICTION.**

(L. C. Card No. Mic 60-971)

John H. Randall III, Ph.D.
University of Minnesota, 1957

This thesis attempts to explain the development of Willa Cather's fiction by tracing the growth of her mind. The term "growth" is something of a misnomer, for her development is actually a narrowing down of interests, of sympathies, and of artistic achievement. The reason is the extraordinary rigidity of her character which did not permit her to make the slightest concession to changed circumstances, so that when the view of life developed on the Nebraska frontier failed to fit the facts of twentieth-century life, instead of modifying her view she rejected the twentieth century.

Willa Cather's mind was a nineteenth-century product; she saw value as something which arose, not out of the struggle of daily life, but from some realm of the ideal lying far above that struggle. At different periods she

sought the ideal in different quarters. In her youth she thought the good life was that lived by artists and hoped to find the source of value in the world of art. In her middle years she located the source of value in a life lived close to the soil on the Nebraska frontier of her childhood. After the First World War she bewailed the passing of the frontier, which for her spelled the end of all hopes of the good life lived close to the soil; she wrote a series of disillusioned novels which mourned the collapse of value in contemporary America. Finally she ceased to believe that value could be found in the modern world altogether, holding that it was only to be found in the more heroic ages of the past.

Willa Cather's work can be discussed in terms of three main influences: the art-for-art's-sake movement, which contributed the concept of the comely life as a goal and beauty as an ideal; the Populist movement, which supplied her with her particular vision of the good life as one lived close to nature; and the belief that the superior individual can dominate circumstances and achieve his goals by simple exertion of the will. Her best work shows superior protagonists achieving the comely life by exerting their wills on what was for her the ideal proving ground: the Nebraska of frontier days. In spite of her glorification of nature, however, she was always torn between the conflicting claims of civilization and of primitivism. Thus in her first period she portrayed superior individuals successfully exerting their wills in the world of art. But in her second period her protagonists succeed, not in cities but on farms, not in achieving mastery of an art but in taming the frontier. In her third period both pioneers and artists fail because the interdependence of man in modern commercial and industrial society narrows the limits within which the individual will can operate. Finally in her fourth period she turns to the pre-industrial past and writes literature which is escapist because it shows individuals successfully exerting their wills without portraying in any adequate way the obstacles which they have to overcome. Microfilm \$8.25; Xerox \$29.25. 649 pages.

**MEDIEVAL ENGLISH CONCEPTIONS OF HELL
AS DEVELOPED FROM BIBLICAL, PATRISTIC, AND
NATIVE GERMANIC INFLUENCES.**

(L. C. Card No. Mic 60-707)

Raymond Carter Sutherland, Jr., Ph.D.
University of Kentucky, 1953

Three general influences shaped the ideas about hell reflected in medieval English literature the Sacred Scriptures, the writings of the Fathers, and native Germanic traditions. Classical, Oriental, and Celtic influences were negligible.

The medieval scholar, usually a man of the church, found *infernus* used throughout the Vulgate old Testament in the sense of afterworld. This usage was brought constantly to his attention because he had to read his daily offices in the breviary, which was made up mostly of the Psalms. The New Testament taught a new conception: all people died and went to *infernus* but after final Judgment the impious were sent to *gehenna*, an eternal state.

Most medieval scholars and writers tended to consider gehenna only another name for infernus.

Confusion among the Church Fathers, engendered by insufficient understanding of the biblical vocabulary, encouraged the medieval tendency toward oversimplification and error in the literature. A scholar such as St. Jerome clearly saw the distinction between gehenna and infernus, but many of the less perceptive patristic writers confused the terms.

Since the English were a Germanic people, it is reasonable to assume that native Germanic pagan traditions about the afterworld would have survived, at least in some measure. The old pagans had believed that Hel was under the earth and that, at the end of the world, Hel would be thrown into a lower place called Niflhel. Christian eschatological doctrine had similar points, and these resemblances may have aided in the conversion of the pagans. These pagan notions, matching Christian teachings, endured, in a sense, in Christian dogma.

There were two other pagan Germanic notions about the afterworld that were not duplicated in Christianity. The first is the idea that the dead live on, in a sort of shadow existence, in the grave itself. This conception was contrary to Christian dogma; and, significantly, it did not survive in medieval English literature, except in ghost stories and ballads. The second pagan notion not matched by Christian dogma was the idea that hell is somehow associated with the north. This idea, however, was not contrary to Church teaching. Indeed, a passage in Isaiah seemed to lend it some authority, and it survived in medieval literature.

These three sources, The Bible, the Fathers, and Germanic tradition then, account for most of the ideas about the afterworld found in medieval literature. There were, however, other notable influences, the apocryphal gospels being the most important of these. The writers of the early Middle Ages were reserved in speaking of hell, adhering closely to the New Testament accounts. In some of the literature of the later Middle Ages purgatory replaced hell as the place in which souls awaited the Judgment. This view became so extreme that some said it was wrong to pray for a soul in hell. On the other hand, the use of the word hell to mean a temporary waiting place for the Judgment survived.

There is a large class of medieval literature about the otherworld, as distinguished from the afterworld. The afterworld is the life after death, and when the medieval author wrote about it he was largely under the domination of Christian dogma, though affected to some extent by native Germanic traditions. When the medieval author wrote of the otherworld, however, he evidently considered his imagination to be free of ecclesiastical definitions.

Most books in the Middle Ages were written by clergymen or by people taught by the clergy. These authors, as well as those not so directly affected by their native culture and the teaching of the Church. These two influences molded their conceptions of hell as presented in extant manuscripts. Microfilm \$3.60; Xerox \$12.60. 278 pages.

THE BYRONIC HERO: TYPES AND PROTOTYPES.

(L. C. Card No. Mic 60-951)

Peter Larsen Thorslev, Jr., Ph.D.
University of Minnesota, 1959

Although there has never been a full-scale investigation of the origins and development of the Byronic Hero, there has been much incidental discussion, most of it centering not on Byron's works or on his predecessors, but on his biography or on the vast Byronic legend. I believe Byron's Hero can be seen more profitably as the most important evidence in English of the Romantic preoccupation with "great men" and rebellious heroes. In order to place the Byronic Hero in this perspective, I have set up a range of pre-Romantic and Romantic hero types, the literary protagonists most popular in their respective periods.

The eighteenth-century types are products of the peculiar sensibilities of the age of Enlightenment. The taste for primitivism produced the Child of Nature -- already on the wane before Byron began to write. The Man of Feeling was of course a symptom of eighteenth-century sentimentalism. The Gloomy Egoist appeared first in "eschatological" and graveyard poetry, especially in the works of Young and Hervey, and survived in the gentler secular melancholy of the later pre-Romantics. Although both of these hero types were past their peak by the end of the century, they can be looked upon as the progenitors of the Romantic Hero of Sensibility. He is characterized by his essential passiveness, his tender feelings, his subjectivity and exacerbated self-analysis, and his prevailing mood of *Weltschmerz*, and he is best exemplified in the works of Rousseau, in *Werther*, and in *Childe Harold*. Finally, the Gothic Villain, the only rebel among the eighteenth-century types, was gradually humanized and sentimentalized (as was Satan) in the Romantic movement, especially in the Gothic drama.

The Romantic Heroes, on the other hand, are all from the beginning rebellious individualists, at first against society only, later against philosophical first principles and even against God himself. The Noble Outlaw appeared as the robber-baron *Götz von Berlichingen* or as Karl Moor of *Die Räuber*, and in England in border ballads and in Scott's and Byron's romances. Faust was revived as a literary hero in the *Sturm und Drang*, and became the most popular figure in late eighteenth-century German literature. Cain and Ahasuerus were first transformed into titanic heroes in the Romantic movement. Finally, Satan and Prometheus carry this hero-Romanticism to its ultimate conclusion: "total" rebellion in the name of secular or humanist individualism and self-reliance.

All of these hero types appear in Byron's works. The early *Childe Harold* is obviously an amalgamation of the Gothic Villain, the Gloomy Egoist, and the Man of Feeling, and the later *Childe* becomes England's first great Hero of Sensibility. The heroes of the four "Turkish Tales" are all Noble Outlaws with the features of Gothic Villains -- leaders of small "organic" bands, defying society and religious authority, and creating their own standards of good and evil. Finally, in the two "metaphysical" dramas, *Manfred* and *Cain*, Byron gives his rebellious heroes psychological and philosophical depth, especially in *Faustian*

and Promethean characteristics, and thereby illustrates vividly the dominant themes of this heroic tradition.

These literary heroes died out in England almost with Byron, although they lasted through most of the nineteenth century on the continent. There are two important "cultural" survivals, however, even in this century: first, in political-prophetic doctrines of hero-worship, especially in Germany; and second, in philosophies of revolt, of existentialist or "metaphysical" rebellion. There is an important continuity between these contemporary *Weltanschauungen* and the subjective sensibility and defiant Satanism of the Romantic heroic tradition.

Microfilm \$4.45; Xerox \$15.75. 347 pages.

**CONTRARY MUSIC: A STUDY OF THE
PROSE STYLES OF JOHN DONNE.**

(L. C. Card No. Mic 60-1027)

Joan Mary Webber, Ph.D.
The University of Wisconsin, 1960

Supervisors: Professor Helen C. White and
Professor Madeleine Doran

This dissertation gives brief consideration to *Bia-thanatos*, *Essays in Divinity* and the *Devotions upon Emergent Occasions*, but is for the most part concerned with analysis of Donne's sermon style. Dissatisfied with the pseudo-logical and satiric manner of his earliest prose, in his *Essays in Divinity* Donne began to explore the possibilities of the associative and symbolic organization employed in the *Devotions* and in the sermons. The sentences of the sermons, within a paragraph or division, may move in an associative, disconnected fashion; or they may be affectively if not structurally periodic. Frequently by-passing normal syntax, he holds sentence and paragraph together with rhythm and repetition, joining internal change and movement with external order. Two kinds of imagery are predominant. The first is analogical, concrete, vivid and dramatic, concerned to show the relations between things in a specific and measurable way, or to describe spiritual process in mechanical and manipulatable figures. The second is symbolic and sacramental, concerned with the natural expression of spiritual truths in the physical world. Donne achieves immediacy in his sermons by use of tools familiar in meditational literature; among these are dramatic dialogue and scene-setting, and vivid contrasts between darkness and light, despair and joy. His immediacy is always qualified, however, both by the fact that the scenes tend to become emblematic and symbolic; and by the fact that the signal importance he attributes to words inspires a continual weaving back and forth between word and thing. The aspect of his sermon style most strongly reminiscent of his poetry is his pervasive use of the first person, which, while it is often a corporate 'I', is a corporate 'I' individualized in Donne; it is the personality of Donne preaching himself which most fully imparts to a particular doctrinal theology a universal interest and application.

Microfilm \$5.15; Xerox \$18.25. 401 pages.

**PROBLEMS IN TRANSLATION:
MODERN AMERICAN DRAMAS IN GERMAN.**

(L. C. Card No. Mic 60-847)

Gerhard H. W. Zuther, Ph.D.
Indiana University, 1959

The study consists of critical evaluations of the German translations of seven modern American plays. These plays, introduced in a brief résumé of their stage success in Germany, are: Eugene O'Neill: *Mourning Becomes Electra*; Arthur Miller: *Death of a Salesman* and *The Crucible*; Thornton Wilder: *Our Town*; Tennessee Williams: *Glass Menagerie*, *A Streetcar Named Desire*, and *Camino Real*. The first chapter provides an outline of the method of investigation and a summary of the most important theories of translation. The method consists in the collection and evaluation of all deviations from the original, and in the analysis of particularly felicitous passages.

Thus Chapter II deals with "Omissions," which are categorized as belonging to the following types: omissions of local or historical allusions; omissions on grounds of sensitivity; larger omissions; omissions on the grounds of over-explicitness; omissions of stage directions. The inferences drawn from the number and kind of omissions indicate that successful dramatic translation requires greater freedom than the rendition of other genres in a foreign language.

In the counterpart Chapter III, "Additions" are classified as providing intensified characterization of situation or person; as clarifying things merely hinted at in the original; as contributing special effects; as giving more detailed stage directions; and finally, one as being an original addition. While some of these additions are either harmless or beneficial to the understanding of the play, others prove more dangerous than most of the omissions, since adding to an author is the most deliberate and hazardous kind of deviation from the original.

Chapter IV, "Mistranslations," separates obvious misreadings, apparent errors, and those renditions which definitely change the meaning of the original. These are errors concerning the tone of the original; mistranslations of single words and concepts; and those of proverbs, puns and idioms. Most of these errors stem from a simple, and often quite excusable ignorance of American civilization and of conversational usage. Often they appear quite insignificant if judged out of context; but they have a disturbing effect on neighboring dialogue, which is particularly detrimental in fast-moving dramatic action.

Chapter V, "Successes," attempts the appraisal of unusually effective translations of many difficult passages. Here the translators demonstrate, often in courageously free renditions, that they have caught the spirit of the original despite manifold obstacles and reproduced it forcefully in their own versions.

The "Conclusion" first evaluates the overall quality of each of the seven translations investigated: while they differ a great deal in vivacity and smoothness, they are all found to be reasonably accurate and consistently adequate. Finally some broader generalizations are derived from these limited analyses; some traditional rules of translation are applied to the particular cases; and some recent views on translation are tested and applied to modern dramatic translation into German.

Microfilm \$2.85; Xerox \$9.90. 219 pages.

**CULTURAL SIGNIFICANCE OF THE
MINNEAPOLIS PUBLIC LIBRARY IN ITS
ORIGINS AND DEVELOPMENT: A STUDY IN THE
RELATIONS OF THE PUBLIC LIBRARY AND
AMERICAN SOCIETY.**

(L. C. Card No. Mic 60-974)

Sister Mary Edmund Lincoln, C. S. J., Ph.D.
University of Minnesota, 1958

The free public library has been neglected in the study of American civilization. Because American society is pluralistic and the public library is influenced in its growth by local conditions as well as by national trends, many public libraries need to be studied in their origins and development before the American public library movement or patterns of library development can be fully understood. In pioneer studies of library origins in Boston, where the first public library was established, certain political, economic, social, and cultural factors were found to have had major influence, and a study of library origins in Chicago showed the influence of essentially the same factors. These factors may be reduced to four: economic ability, a favorable attitude toward culture, civic pride, popular support. The present investigation of the public library in another city, Minneapolis, shows that similar factors were at work.

This study begins with a survey of American library history and an analysis of the ideas and theories behind the nineteenth-century public library movement. The origins and development of the Minneapolis Public Library, considered in the context of the total social environment and interpreted in the light of both local and national trends, are presented in historical detail in the central portion of the thesis. The study concludes with an analysis of factors most influential in the establishment of the Minneapolis library and with a discussion of the relationship of the public library to the society out of which it developed.

Conditions resulting from the growth of industry; the traditional American faith in education and reading; the contributions of philanthropy to the public welfare; the efforts of local government to increase its services; the symbolic need for society to have an institution which would embody the ideals of nineteenth-century democracy--all of these were behind the efforts of Minneapolis citizens to have a library. Settled in the 1850's, Minneapolis had the beginnings of a civic library by 1859. The Minneapolis Athenaeum, during the city's first quarter century of phenomenal growth, satisfied two practical aims of leaders: it provided them with books and it served as a mark of civic prestige. The Athenaeum, a private institution, became increasingly popular and experienced a growing need for public support. By the early 1880's, the city was able, financially and legally, to provide a public library for the citizens. Aware that the establishment of a public library was a suitable means of raising the level of community culture, the leaders of the Athenaeum and the city government agreed to unite their efforts. Control of the library which they established was placed in the hands of an independent board which was to be directly responsible to the citizens. The monumental public library building, opened in 1889, was regarded by leaders and citizens alike as an appropriate sign of cultural and economic progress.

Although the public library idea was of national interest in the late nineteenth century and many discussions were devoted to a definition of the library's functions and social role, Minneapolis leaders, busy with the practical task of providing books and a building, did not concern themselves directly with the theoretical goals envisioned by the founders of public libraries in Boston and elsewhere. Ultimately, however, the major ideals of the American public library movement were embodied in the Minneapolis Public Library. The story of this library demonstrates the American phenomenon of local variations within a broader general pattern and helps to define the relationship of the American public library and American society.

Microfilm \$4.95; Xerox \$17.55. 388 pages.

MATHEMATICS

LOWER BOUNDS FOR EIGENVALUES

(L. C. Card No. Mic 60-1275)

Norman William Bazley, Ph.D.
University of Maryland, 1959

Supervisor: Professor Alexander Weinstein

The procedure given here for finding lower bounds is an essential modification of a method which goes back to A. Weinstein and was extended by Aronszajn. Let A be a semi-bounded self-adjoint operator in a Hilbert space \mathcal{H} . Suppose $A = \bar{A} + A^1$ where \bar{A} is a semi-bounded self-adjoint operator and A^1 is symmetric and positive definite. We assume that the eigenvalue problem for \bar{A} has a known solution. Let the lowest part of the spectrum of both A and \bar{A} consist only of an infinite number of eigenvalues with finite multiplicities.

The eigenvalue problem for \bar{A} is called the base problem and gives rough lower bounds. If \bar{u}_i ($i = 1, \dots, k$) are k eigenvectors of \bar{A} and if $p_i = (A^1)^{-1} \bar{u}_i$ ($i = 1, \dots, k$) exist, then one can improve the lower bounds by explicitly solving the intermediate eigenvalue problem with operator $A^{(k)} = \bar{A} + A^1 P^{(k)}$; here $P^{(k)}$ is the projection on the subspace generated by the elements p_i in the Hilbert space \mathcal{H}^1 with norm $(A^1 u, u)^{1/2}$. Because of the choice of each p_i , one need only solve a polynomial equation instead of the transcendental equation required in the general theory. As an application, lower bounds to the eigenvalues of Mathieu's equation and the helium atom are computed.

Microfilm \$2.50; Xerox \$3.00. 46 pages.

THE DEVELOPMENT AND ORGANIZATION OF TEACHING MATERIALS IN A COLLEGIATE MATHEMATICS PROGRAM FOR STUDENTS OF THE NON-PHYSICAL SCIENCES, PART II.

(L. C. Card No. Mic 59-5700)

Gerald Anthony Becker, Ph.D.
State University of Iowa, 1959

Chairman: Professor H. Vernon Price

For a number of years there has been a rather widespread belief that the collegiate mathematics curriculum consisting of college algebra, trigonometry, analytical geometry, and calculus does not meet the demands of the student majoring in the various areas of the non-physical sciences. Numerous individuals have voiced this dissatisfaction, as have various committees which were set up to study the problem of mathematical training in the social sciences and psychology.

As a result of such feelings a study was undertaken at the State University of Iowa by Robert C. Seber to discover the mathematical needs of the students in psychology and the various areas of the social sciences and to propose a method whereby these needs might be satisfied.

Seber's original intent was to survey the entire social science area along with psychology. It was soon evident that the task was far too great for one individual to handle. Thus the study was divided, with Seber's investigation of the mathematical needs in the area of psychology and the construction of a curriculum to meet those needs being labeled Part I, and the present investigation which is concerned with the areas of economics and sociology being labeled Part II.

The method used to determine the mathematical needs of the student in the areas of psychology, economics, and sociology consisted of an examination of the current literature. Included were journals and textbooks, as well as reports and statements of various committees and individuals interested in this problem of mathematical training in the various areas of the non-physical sciences.

After determining the mathematical concepts which seemed important to the student in these areas, curricula embodying these concepts and using appropriate illustrative and exercise materials were organized.

Concepts occurring with some degree of regularity in the areas of economics and sociology were as follows:

1. Relations and Functions. Order relations; polynomial (especially linear and quadratic), rational, exponential and logarithmic functions and their graphs; use of functions to approximate statistical data (recognizing linear, quadratic, and exponential trends).
2. Elements of differential and integral calculus. Differentials and approximations; higher derivatives; partial derivatives; multiple integration; various applications including maxima and minima problems, probability and statistics.
3. Vectors and Matrices. Vectors as n -tuples; vector algebra; matrix algebra and applications to linear systems, linear transformations, and Markov chains.
4. Linear systems. Systems of linear equations -- solutions by determinants; homogeneous systems; systems of inequalities.
5. Set algebra. Inclusion, union, intersection, and complement.
6. Axiomatic systems. The role of basic terms, definitions, axioms, and conclusions as used in the construction of models.
7. Probability and Statistics. Conditional and independent probabilities; probability distributions and density functions; mean, weighted mean, variance, standard deviation, correlation, sampling, scatter diagrams, regressions (both linear and curvilinear), statistical inference.
8. Differential and Difference Equations. First and second order equations, homogeneous equations.

The curriculum organized under Part II of the study

and incorporating many of the above stated concepts as well as illustrative and exercise materials from the areas of economics and sociology is attached as an appendix to the dissertation.

Microfilm \$8.50; Xerox \$30.15. 669 pages.

INVERSION WITH RESPECT TO A CUBIC OF THE SYZYGETIC PENCIL

(L. C. Card No. Mic 60-638)

Elsie Temple Church, Ph.D.
University of Kentucky, 1951

I. INTRODUCTION.

The purpose of this paper is to develop inversion using a cubic as the base curve instead of a conic section. To simplify algebraic manipulations any cubic of the pencil of syzygetic cubics has been chosen as the base curve. This is permissible; for any non-singular cubic by proper transformations can be put in the form of one of these cubics.

II. THE EQUATIONS OF THE INVERSE TRANSFORMATION.

Take a fixed point as the origin and a fixed fundamental cubic as the base. Points collinear with the origin and conjugate with respect to the base are said to be inverse. A line through the origin and a generic point P' will intersect the polar line of P' with respect to the cubic in a point P . P and P' are conjugate points.

Take the base curve F as one of the syzygetic pencil, $F \equiv x_1^3 + x_2^3 + x_3^3 - 3\lambda x_1 x_2 x_3 = 0$ and the fixed origin as A_3 . The equations of the cubic inverse transformation are derived through use of the polar line of a point $P'(x'_1, x'_2, x'_3)$, with respect to F , and the line $A_3 P'$. The equations are

$$x_1 : x_2 : x_3 = \lambda x'_1 x'_2 - x'_1 x'^2_2 : \lambda x'_1 x'_2 - x'_2 x'^2_3 : x'_1 + x'_2 - 2\lambda x'_1 x'_2 x'_3.$$

III. THE NATURE OF THE CUBIC INVERSE TRANSFORMATION.

In cubic inversion, the formulae of the transformation are in the form $x_1 : x_2 : x_3 = f_1 : f_2 : f_3$, where f_1, f_2, f_3 are rational functions of the third degree in x'_1, x'_2, x'_3 . To the lines $x_1 = 0, x_2 = 0, x_3 = 0$ will then correspond the cubics $f_1 = 0, f_2 = 0, f_3 = 0$.

Since f_1, f_2, f_3 have seven points in common, to any position of (x_1, x_2, x_3) there will correspond only two points (x'_1, x'_2, x'_3) .

IV. THE JACOBIAN OF THE NET OF CUBICS.

The Jacobian of the net of cubics $\alpha_1 f_1 + \alpha_2 f_2 + \alpha_3 f_3 = 0$ is a curve of order $3(n-1)$ which has double points at the seven base points of the net and also at A_1 and A_2 .

V. THE INVERSES OF CURVES AND POINTS.

The inverse of an n -ic is a $3n$ -ic through the seven base points. If the n -ic is of order higher than the first, the base points are at least double points on the $3n$ -ic.

Every n -ic through A_3 is transformed into a $3n$ -ic which is degenerate. The $3n$ -ic always contains the conic $\lambda x_1 x_2 - x_3^2 = 0$ as part of it.

VI. THE EFFECTS OF THE TRANSFORMATION ON THE MULTIPLE POINTS OF AN N -IC.

Theorem I: An n -ic which has a k -ple point at A_1 but does not go through A_2 or A_3 is transformed into a $3n$ -ic which does not go through A_1 or A_2 but has an n -ple point at A_3 .

Theorem II: An n -ic which has a k -ple point at A_2 but does not go through A_1 or A_3 is transformed into a $3n$ -ic which does not go through A_1 or A_2 but has an n -ple point at A_3 .

Theorem III: An n -ic which does not pass through A_1 or A_2 but has an s -ple point at A_3 is transformed into a $3n$ -ic with s -ple points at both A_1 and A_2 , and an n -ple point at A_3 .

Theorem IV: An n -ic with a k -ple point at A_1 , an r -ple point at A_2 , and an s -ple point at A_3 is transformed into a $3n$ -ic with an n -ple point at A_3 and s -ple points at both A_1 and A_2 .

VII. INVARIANTS.

There are $3n$ invariant points on any n -ic. Any cubic intersects the base cubic in nine invariant points. Three of these points lie on a straight line and the remaining six lie on a conic.

In general the cross ratio of four collinear points under this transformation is not invariant but cross ratio on $x_1 = 0$ and $x_2 = 0$ is a covariant.

In general distance is not invariant but it is a covariant on the lines $x_1 = 0$ and $x_2 = 0$.

VIII. SPECIAL VALUES OF λ .

Interesting results are obtained when λ is assigned one of the cube roots of unity as its value.

IX. A SPECIAL BASE.

If the base cubic is the coordinate triangle $F \equiv x_1 x_2 x_3 = 0$ and the origin is A_3 , the cubic inverse transformation is a linear birational transformation.

Under this transformation a line is either invariant or goes into a line parallel to its original position; therefore the angle between two curves is invariant.

It can be proved that distance is a covariant and cross ratio is an invariant under this transformation.

Microfilm \$2.50; Xerox \$3.00. 32 pages.

MAXIMAL COMMUTATIVE ALGEBRAS OF LINEAR TRANSFORMATIONS

(L. C. Card No. Mic 60-988)

Richard Carson Courter, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Charles W. Curtis

The problem of classifying the maximal commutative subalgebras of K_n where K is an algebraically closed field

is now a classical problem. Classifications were made by C. Jordan (1905) and B. Charles (1954) for small values of n . For a special case E. M. Patterson (1957) has provided a classification. In 1957 H. S. Allen characterized a class of maximal commutative algebras R which satisfy: the square of the radical of R is zero and R is completely primary. This problem, which will be referred to as problem I, is a special case of

Problem II: Under what conditions on an R -module M which is assumed to satisfy both chain conditions do we have $\text{Hom}_R(M, M) = R^*$ where R is a commutative ring with identity and where R^* denotes the R -endomorphisms $\{x_r: x_r(m) = mx \text{ for } m \in M, x \in R\}$.

In this thesis it is proved that Problems I and II may be reduced to the case in which R is completely primary. With R so restricted general conditions are obtained on an R -module M satisfying both chain conditions which imply that $\text{Hom}_R(M, M) = R^*$ and which do not necessarily reduce to either of the previously known general cases, i.e. that M is cyclic or completely indecomposable in the sense of Snapper (1949). In these conditions the submodule of non-generators of M and the completely reducible submodule of M have a role, as does the radical P of R : P satisfies a Chinese remainder condition with respect to a set of ideals. The conditions are both necessary and sufficient in case the square of the radical of R is zero and in two additional cases.

Maximal commutative subalgebras of K_n are obtained by applying the sufficient conditions of the preceding paragraph to the case in which R is a commutative completely primary subalgebra of K_n and M is the n -dimensional space on which R acts. Under these hypotheses, M/M_1 is a direct sum of cyclic indecomposable modules, where M_1 is the maximal completely reducible submodule of M . A commutative completely primary subalgebra R of K_n is maximal commutative if the sufficient conditions are satisfied by the algebra R' of adjoints of R and by the n -dimensional vector space M' (dual to M) on which R' acts; in this case, if K is also assumed to be algebraically closed, the submodule M_2 of nongenerators of M is a direct sum of completely indecomposable modules.

If K is an algebraically closed field, if k denotes the K -dimension of the maximal completely reducible homomorphic image of M , and if d denotes the K -dimension of the maximal completely reducible submodule of M , then the equation

$$K\text{-dim } R - K\text{-dim } M = (k-1)(d-1)$$

is satisfied by the maximal commutative subalgebras obtained by applying the theorems of this thesis and in the cases in which the representation space M of R is cyclic or completely indecomposable. To show that the general classes studied do not exhaust the class of completely primary maximal commutative subalgebras, we obtain examples which do not satisfy the equation on the dimension of R . These are found among the Kronecker products $R \otimes_K S$ where R and S are completely primary, maximal commutative, and among the algebras described above.

Microfilm \$2.50; Xerox \$3.60. 61 pages.

CONVERGENT SOLUTIONS OF ORDINARY LINEAR HOMOGENEOUS DIFFERENCE EQUATIONS IN THE NEIGHBORHOOD OF AN IRREGULAR SINGULAR POINT

(L. C. Card No. Mic 60-917)

William John Andrew Culmer, Ph.D.
University of Minnesota, 1959

This paper deals with the solution of the linear homogeneous difference equation

$$X(s+1) = s^h A(s) X(s),$$

where h is a constant; the independent variable s is complex; and $A(s)$ is a 2×2 square matrix representable as a power series in $1/s$, namely

$$A(s) = A_0 + \frac{A_1}{s} + \frac{A_2}{s^2} + \dots, \quad |s| > s_0,$$

which, as indicated, is convergent in some neighborhood of $s = \infty$. The coefficients A_0, A_1, A_2, \dots are known constant matrices with complex elements. The unknown $X(s)$ is a 2×2 matrix also.

After a preliminary transformation which removes the s^h factor, normalizing non-singular transformations are applied which reduce the constant term A_0 in the new coefficient matrix to one of the canonical forms listed below:

$$\text{I. } \begin{pmatrix} 1 & 0 \\ 0 & \rho \end{pmatrix}; \text{ II. } \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}; \text{ III. } \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}; \text{ IV. } \begin{pmatrix} 1 & 0 \\ \beta & 1 \end{pmatrix}; \text{ V. } \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}.$$

In treating the problem when a lead matrix of types II, III, IV or V arises, it turns out that a number of special situations occur and in total twelve cases and subcases need individual treatment. In all of these various cases one attempts by means of a finite sequence of non-singular transformations to throw the difference equation into such a form that it is satisfied by a formal power series running in powers of either $1/s$ or $1/s^{\frac{1}{2}}$.

In two subcases the procedure used in other cases becomes infinitely repetitive. Special transformations are used to solve these two subcases or reduce them to former cases. It is believed that these two subcases constitute the problems which G. D. Birkhoff in his 1930 Acta Mathematica paper said lead to "indefinite algebraic complications" and for which he did not give a constructive solution. In this paper, by contrast, a straight forward method of computing the formal solution is given in every case.

The second part of the paper considers the question of convergence. In all but the two subcases leading to series in powers of $1/s^{\frac{1}{2}}$, the formal solutions for large $|s|$ are shown to be asymptotic representations of true solutions in certain regions of the s -plane. The asymptotic series solutions in general diverge, nevertheless they are shown to be Borel summable and replaceable by convergent factorial series, which would permit one to compute true solutions to within any prescribed degree of accuracy.

Microfilm \$2.50; Xerox \$6.40. 135 pages.

ON REDUCIBLE PLANE ALGEBRAIC CURVES

(L. C. Card No. Mic 60-652)

James Christy Flack, Ph.D.
University of Kentucky, 1950

In this paper, deficiency is defined for a reducible plane algebraic curve by the use of the following theorem:

Theorem 1, Section III. If $F_n \equiv F_{n_1} \cdot F_{n_2} \cdots F_{n_k} = 0$,

where the $F_{n_i} = 0$ are distinct and irreducible, then the maximum number of double points or equivalent singularities possible is given by

$$M = \frac{1}{2}(n-1)(n-2) + (k-1).$$

Deficiency is then defined by

$$(2) \quad p = \frac{1}{2}(n-1)(n-2) + (k-1) - c - \frac{1}{2} \sum_0 d_0 r_0 (r_0 - 1),$$

where c indicates the number of cusps, and d_0 the number of multiple points of order r_0 . This may be rewritten

$$(3) \quad p = p_1 + p_2 + \cdots + p_k,$$

where p_i is the deficiency of the factor $F_{n_i} = 0$. Deficiency so defined is not negative, and is invariant with respect to Cremona transformation.

If the restriction against coincident factors is dropped, then the equation of the curve becomes

$$F_n \equiv \left(\prod_{i=1}^t F_{n_i}^{q_i} \right) F_{n_{q+1}} \cdots F_{n_k} = 0$$

where $q = \sum_{i=1}^t q_i$. Then the maximum number of singularities, excepting those which result only from coincidence, is given by

$$(4) \quad M = \frac{1}{2}(n-1)(n-2) + (k-1) - \sum_{i=1}^t q_i \binom{n_i}{2}.$$

If one factor is taken from each group of coincident factors of $F_n = 0$, they, together with the distinct factors of $F_n = 0$ form the auxiliary curve

$$F_{n-g} \equiv F_{n_1} \cdot F_{n_2} \cdots F_{n_t} \cdot F_{n_{q+1}} \cdots F_{n_k} = 0,$$

where $g = \sum_{i=1}^t (q_i - 1)n_i$. The maximum number of singularities for this curve is given by

$$(5) \quad M' = \frac{1}{2}(n-g-1)(n-g-2) + [k - \sum_{i=1}^t (q_i - 1) - 1]$$

and the maximum number of countable singularities for $F_n = 0$ is

$$(6) \quad M = M' + \sum_{i=1}^t \frac{1}{2}(q_i - 1)(n_i - 1)(n_i - 2) + \frac{1}{2} \sum_{i \neq j=1}^t (q_i - 1)(q_j - 1)n_i n_j + \sum_{i=1}^t \sum_{j=q+1}^k (q_i - 1)n_i n_j.$$

Then deficiency is defined by

$$(7) \quad p = M - c - \frac{1}{2} \sum_0 d_0 r_0 (r_0 - 1),$$

which may be written

$$(8) \quad p = \sum_{i=1}^t (q_i - 1)p_i + p',$$

where p' indicates the deficiency of $F_{n-g} = 0$.

In Section IV, the form and properties of adjoint curves to $F_n = 0$ are studied. If $F_n = 0$ has only distinct factors, the adjoint curve of degree m is

$$(1) \quad \phi_m \equiv \phi_{m_1} \frac{F_n}{F_{n_1}} + \phi_{m_2} \frac{F_n}{F_{n_2}} + \cdots + \phi_{m_k} \frac{F_n}{F_{n_k}} = 0$$

where $\phi_{m_i} = 0$ is an adjoint curve of degree $m_i = m - n + n_i$ to the factor $F_{n_i} = 0$. If the restriction against coincident factors is dropped, the adjoint becomes

$$(5) \quad \phi_m \equiv \prod_{i=1}^t F_{n_i}^{q_i-1} \left[\sum_{i=1}^t \left(\phi_{m_i} \frac{F_{n-g}}{F_{n_i}} \right) + \phi_{m_{q+1}} \frac{F_{n-g}}{F_{n_{q+1}}} + \cdots + \phi_{m_k} \frac{F_{n-g}}{F_{n_k}} \right] = 0.$$

The portion of (5) inside the bracket is the adjoint of degree $m - g$ to $F_{n-g} = 0$ and is known as the proper adjoint.

Definition: A special adjoint to $F_n = 0$ is an adjoint of degree $n - 3$.

The following theorems on special adjoints are proved:

Theorem 1. If $F_n = 0$ has only distinct irreducible factors, then the number of arbitrary coefficients in the equation of the special adjoint $\phi_{n-3} = 0$ is equal to $p - k$.

If the restriction against coincident factors is dropped, then

Theorem 2. The number of essential arbitrary constants in the equation of the special adjoint to $F_n = 0$ is equal to $p' - k'$.

Theorem 3. If $F_n = 0$ possesses only distinct factors, then the number of intersections between $F_n = 0$ and $\phi_{n-3} = 0$ which are absorbed by the multiple points on $F_n = 0$ is $(n-1)(n-2) + 2(k-1) - 2p$.

If the restriction against coincident factors is removed, then

Theorem 4. The number of intersections of the proper adjoint with $F_{n-g} = 0$, outside of the multiple points, is $2p' - 2k'$.

Under the same conditions as the preceding theorem,

Theorem 5. The dimensionality of the special adjoint to $F_n = 0$ is $p' - k'$, and the number of free intersections between $F_n = 0$ and the adjoint is $2p - 2k$.

If non-special adjoints are restricted by being made to pass through A fixed points on $F_n = 0$, the following inequality results:

Theorem 6. The complete non-special series on $F_n = 0$ has $N - r \leq 2p - p' + 2(k' - k) + ga$.

Now since any point of intersection between the adjoint to $F_n = 0$ and any factor $F_{n_i} = 0$ which is not a multiple point on $F_n = 0$ must be also a point on $\phi_{m_i} = 0$, it follows from the Brill-Noether reduction theorem and the special series theorem that the inequalities may be removed.

Theorem 7. If $F_n = 0$ has only distinct factors, and if $N - r \leq p - k$, then the series is special, so that for the complete non-special series, $N - r = p$.

Then, if coincident factors are permitted,

Theorem 8. The complete non-special series has $N - r = 2p - p' + 2(k' - k) + ga - A'$.

If in forming the complete non-special series on a reducible curve with coincident factors, the proper adjoint is made special and unrestricted, there results a series with $r = p' - 2k' + (n - g)g$, $N = 2p - 2k + ng$, $N - r = 2p - p' + 2(k' - k) + g^2$, which includes the g_{2p-2k}^{p-k} as a special case.

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A GENERALIZED HARMONIC CONJUGATE FOR COMMUTATIVE ALGEBRAS

(L. C. Card No. Mic 60-654)

Achilles Elmer Foster, Ph.D.
University of Kentucky, 1951

The paper is concerned with a linear algebra over a non-modular field F with the multiplication table $e_i e_j$

$= \sum_{k=1}^n c_{ijk} e_k$. The matrices $R_i = (c_{isr})$; $S_i = (c_{ris})$; and

$Q_i = (c_{rsi})$; where r denotes the row and s denotes the column of the indicated matrix, are, respectively, the right regular representation, the left regular representation, and the parastrophic matrices of the algebra. In this paper only commutative algebras with a unit element are considered.

Suppose u_1, \dots, u_n are scalar functions of the scalar variables x_1, \dots, x_n . We say that $u = u_1 e_1 + \dots + u_n e_n$ is a function of $x = x_1 e_1 + \dots + x_n e_n$ and define the derivative of u with respect to x , du/dx , to be the matrix

$$du/dx = \left(\frac{\partial u_r}{\partial x_s} \right)$$

where $\partial u_r / \partial x_s$ is the element in the r -th row and the s -th column.

The function u is an analytic function of x if du/dx is in the right regular representation of the algebra, that is, if functions v_1, \dots, v_n exist such that $du/dx = v_1 R_1 + \dots + v_n R_n$.

A Frobenius algebra is defined to be a linear associative algebra in which there exists a number $\alpha = \sum_{i=1}^n a_i e_i$ in the algebra such that $Q(\alpha) = \sum_{i=1}^n a_i Q_i$ is non-singular.

The $(n^2 - n)/2$ homogeneous partial differential equations of second order of the form

$$\frac{\partial^2 u}{\partial x_r \partial x_j} = \sum_{i=1}^n c_{rji} \frac{\partial^2 u}{\partial x_i \partial x_1} \quad (1)$$

are called the generalized Laplace equations for the algebra.

The results of this paper are summarized below.

Theorem 1. With every set of $(n^2 - n)/2$ homogeneous partial differential equations of second order of the form

$$\frac{\partial^2 u}{\partial x_r \partial x_j} = \sum_{i=1}^n c_{rji} \frac{\partial^2 u}{\partial x_i \partial x_1} \quad (r = 2, \dots, n) \quad (j = r, \dots, n) \quad (2)$$

we can associate a unique commutative distributive algebra over the field of the c 's with unit element such that (2) will be the Laplace equations of the algebra if the c_{rji} make the algebra Frobenius and associative.

Definition: Let u_p be any scalar function satisfying the equations (2). We shall say that $u_1, \dots, u_{p-1}, u_{p+1}, \dots, u_n$ are the generalized harmonic conjugates of u_p in an algebra A if $u = u_1 e_1 + \dots + u_n e_n$ is an analytic function.

The conditions for the exactness of the integrals giving the conjugates of u_p are contained in

Theorem 2. If all Q_p are non-singular a necessary and sufficient condition that the integrands which determine the u_i be exact for all u_p which satisfy (2) is that the algebra be associative.

Theorem 3. For every function u_p satisfying the Laplace equations (1) of a Frobenius algebra it is possible to find its conjugate functions.

In particular, we prove **Theorem 4.** In a non-associative commutative algebra of order three with a unit element and multiplication constants defined by (2), the harmonic conjugates of a continuous scalar function u_1 of x_1, x_2, x_3 satisfying equations (1) exist if and only if u_1 is also a simultaneous solution of two differential equations of the form

$$A_1 \frac{\partial u_1}{\partial x_1} + A_2 \frac{\partial u_1}{\partial x_2} + A_3 \frac{\partial u_1}{\partial x_3} = 0$$

$$B_1 \frac{\partial u_1}{\partial x_1} + B_2 \frac{\partial u_1}{\partial x_2} + B_3 \frac{\partial u_1}{\partial x_3} = 0$$

where the A 's and B 's are constants that depend on the multiplication table of the algebra.

The paper continues with some results concerning a paper by Bechk-Widmanstetter in 1912.

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SOME RESULTS IN THE THEORY OF QUEUES

(L. C. Card No. Mic 60-891)

Donald P. Gaver, Jr., Ph.D.
Princeton University, 1956

Chapter I: A single-server queuing process, with compound Poisson input and service times possessing an arbitrary bounded density function, is discussed. The state of the process is the number of customers present, augmented by the service age of the customer being served. Differential equations are derived for the probability distribution of the state at any time, and are solved operationally. It is shown that the solutions have the characteristics of transition probabilities of a Markov process in continuous time. The ergodic properties of the process are investigated. Some first passage time distributions are obtained.

Chapter II: The process of Chapter I is discussed, but this time the state is taken to be the waiting time at the queuing system. Results obtained are similar to those of Chapter I.

Chapter III: A single-server queuing process with a "filtered" compound Poisson input and arbitrarily distributed service times is discussed. The state is again taken to be the waiting time, and the Laplace transform of the stationary distribution of waiting times is found. Some specific examples are given.

Chapter IV: The output process of a single-server queuing system with Poisson input and exponential service times that has attained its stationary distribution is shown to be Poisson with rate equal to the input rate. The joint stationary distribution of the number of customers present in each of two single-server, exponential service time, Poisson input systems arranged in series is derived, and the numbers of customers in the two systems are shown to be independently and geometrically distributed. The total queuing time of a customer coming to such a system when the stationary distribution may be assumed to apply is shown to be the sum of two independently and exponentially distributed parts.

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DERIVATIVES AND ORDERS OF CONVERGENCE OF FOURIER SINE SERIES

(L. C. Card No. Mic 60-663)

Paul William Healy, Ph.D.
University of Kentucky, 1950

This paper investigates the properties of the derivatives of certain types of Fourier sine series, and considers the problem of extending these results to more general types of series. The problem was suggested by some results obtained by H. H. Downing in a recent article (H. H. Downing, *Sums of Sines Converted to Numerical Sums*, *American Mathematical Monthly*, Vol. LVI, p. 630).

Consider the example

$$(1) \quad x(1 + \cos x) = \frac{3}{2} \sin x + 2 \left(\frac{\sin 2x}{1 \cdot 2 \cdot 3} - \frac{\sin 3x}{2 \cdot 3 \cdot 4} + \dots \right)$$

Divide both sides by x , term by term, and write the quotient:

$$1 + \cos x = \frac{3}{2} \frac{\sin x}{x} + 2 \left(\frac{\sin 2x}{1 \cdot 3 \cdot 2x} - \frac{\sin 3x}{2 \cdot 4 \cdot 3x} - \dots \right)$$

Take the limit on both sides as $x \rightarrow 0$ and obtain

$$\frac{1}{4} = \frac{1}{1 \cdot 3} - \frac{1}{2 \cdot 4} + \frac{1}{3 \cdot 5} - \dots$$

The results obtained in the above example and in the examples in the article by Downing suggest the following theorems:

Theorem I. The result of dividing a series of terms, $u_n = a_n \sin nx$, by x and taking the limit as $x \rightarrow 0$, is the same as taking the derivative of u_n with respect to x and then setting $x = 0$.

Theorem II. If $(C, k) \sum a_n = A$ and $(C, k) \sum b_n = B$ then $(C, k) \sum (\alpha a_n + \beta b_n) = \alpha A + \beta B$

The converse of Theorem II is false, however.

Even though a series may converge, it may do so in many different ways. In fact, it is known that there is no

most slowly converging series. It is possible, however, to define the order of convergence for some types of series.

If the given series is $\sum \frac{1}{n^k}$ let $r(n, k) = \frac{1}{n^{k+1}}$, and if the given series is $\sum (-1)^{n+1} \frac{1}{n^k}$ let $r(n, k) = (-1)^{n+1} \frac{1}{n^k}$. Then the general series

$$r(n, k) \begin{cases} \frac{1}{1^{k+1}} + \frac{1}{2^{k+1}} + \frac{1}{3^{k+1}} + \dots \\ \frac{1}{1^k} - \frac{1}{2^k} + \frac{1}{3^k} - \dots \end{cases} \quad \text{converge } (S, k)$$

or converge to the k^{th} order. If we are given any convergent series, $\sum a_n$, $a_n = O[r(n, k)]$, $k \geq 1$, then we say that $\sum a_n$ converges (S, k) .

Consider the series

$$(2) \quad \frac{3}{2} + \frac{2}{1 \cdot 2 \cdot 3} + \frac{2}{2 \cdot 3 \cdot 4} + \frac{2}{3 \cdot 4 \cdot 5} + \dots$$

Then

$$\lim_{n \rightarrow \infty} \frac{a_n}{r(n, 2)} = \lim_{n \rightarrow \infty} \frac{\frac{2}{(n-1)n(n+1)}}{\frac{1}{n^3}} = 2$$

and the series converges order 2.

If $\lim_{n \rightarrow \infty} \frac{a_n}{r(n, k)} = 0$ and also $\lim_{n \rightarrow \infty} \frac{a_n}{r(n, k+1)} = \infty$ we define

the order of convergence to be $(S, k+1)$ if $k \geq 0$. It should be noted that a series with alternating signs which is derived from a series convergent $(S, 1)$ i.e., an alternating series convergent $(S, 0)$ and hence divergent is nevertheless summable by Cesaro's method. On the other hand a series of positive terms derived from a series convergent $(S, 1)$ is not summable by any regular method.

Theorem III. If there is given a Fourier sine series,

$$\sum_{n=1}^{\infty} a_n \sin nx, \text{ with } a_n > 0 \text{ or } (-1)^{n+1} a_n > 0 \text{ for all } n;$$

and if the series $\sum_{n=1}^{\infty} a_n$ converges (S, k) , then the series obtained from the sine series by dividing each

term by x and taking the limit as $x \rightarrow 0$, that is $\sum_{n=1}^{\infty} u_n$

where

$$u_n = \lim_{x \rightarrow 0} \frac{a_n \sin nx}{x} = n a_n,$$

converges $(S, k-1)$; the order of convergence of the derived series is one less than the order of convergence of the coefficients of $\sin nx$ in the original series.

The coefficients of the sines and cosines in the derivatives of a Fourier sine series converge to successively lower orders, each derivative having coefficients of order

one less than the preceding derivative. Thus if $\sum_{n=1}^{\infty} a_n$

converges (S, k) , the coefficients of the k^{th} derivative will form a series that diverges.

Theorem IV. If the terms of a series form a geometric progression, and if the series converges, then it converges (S, ∞) .

It is extremely difficult to predict how the derived series will behave if the form of the function is allowed to vary widely - in fact it can only be done if the character of the function is taken into account. The following example will illustrate this.

Consider the series $\sum_{n=1}^{\infty} n \sin^2 \frac{x}{n^2}$, which converges for all x . Set $g(x) = \sum_{n=1}^{\infty} n \sin^2 \frac{x}{n^2}$ divide by x^2 and take the limit as $x \rightarrow 0$

$$\lim_{x \rightarrow 0} \frac{g(x)}{x^2} = \sum_{n=1}^{\infty} \frac{1}{n^3}$$

This last series converges (S,2); yet the series of coefficients of $\sin^2 \frac{x}{n^2}$, $\sum_{n=1}^{\infty} n$, is properly divergent.

This example shows that there is no close relationship for a general series of the form $\sum_{n=1}^{\infty} a_n f(x,n)$ between the a_n 's and c_n , where $c_n = \lim_{x \rightarrow 0} \frac{a_n f(x,n)}{g(x)}$, even if the latter limit exists. It is necessary to consider the nature of $f(x,n)$ and $g(x)$ in each case, before the result could be predicted. Microfilm \$2.50; Xerox \$3.00. 22 pages.

THE REPRESENTATION OF ZERO BY ODD k^{th} POWER DIAGONAL FORMS

(L. C. Card No. Mic 60-1040)

James Earl Householder, Ph.D.
University of Colorado, 1959

Supervisor: Professor Savardaman Chowla

It is proved here that any diagonal form of odd degree k having non-zero, integer coefficients will, for some set of integer values of the variables, represent zero non-trivially provided that the form has at least $6k \log k + 11k$ variables and that at least $4k + 1$ of the coefficients are relatively prime by pairs. The proof is obtained by use of Vinogradov's improvement of the Hardy-Littlewood Method. The upper bound obtained for the number of variables required for the non-trivial representation of zero is greater than 32 as obtained by Davenport for the case $k = 3$, but for all higher odd values of k , the upper bounds $6k \log k + 11k$ are, to the best of the writer's knowledge, the lowest so far obtained for forms of the kind treated.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

A CLASS OF SIMPLE GAMMA DELTA RINGS

(L. C. Card No. Mic 60-1201)

Carl Christopher Maneri, Ph.D.
The Ohio State University, 1959

A (γ, δ) ring is one satisfying the identities $(x, y, z) + (y, z, x) + (z, x, y) = 0$, and $(z, x, y) + \gamma(x, z, y) + \delta(y, z, x) = 0$

with $\gamma^2 - \delta^2 + \delta = 1$. The study of such rings was prompted by A. A. Albert when he showed that most of what he called almost alternative algebras were quasiequivalent to either right alternative algebras or to (γ, δ) algebras. Quasiequivalence preserves ideals, and nilpotency of elements; hence it preserves nil ideals and simplicity of the algebras.

The $(-1, 1)$ rings (i.e., $\gamma = -1, \delta = 1$) are a sub-class of the (γ, δ) rings. They are also a sub-class of the right alternative rings.

In this dissertation simple $(-1, 1)$ rings of characteristic, not 2 or 3, are studied. The main result is that if such rings possess an idempotent, then that idempotent is a unity or the ring is associative. Another conclusion obtained in this dissertation is that these rings possess no proper left ideals unless they are associative.

An example of a $(-1, 1)$ ring is given. It is a finite dimensional algebra that possesses an idempotent which is not a unity element. The algebra is of course not simple. This shows the necessity of assuming simplicity in the main result. Microfilm \$2.50; Xerox \$3.00. 47 pages.

MODIFICATION OF THE FIRST NECESSARY CONDITION IN THE CALCULUS OF VARIATIONS FOR THE PARAMETRIC NON-HOMOGENEOUS CASE

(L. C. Card No. Mic 60-1226)

John Karl Reckzeh, Ph.D.
University of Kentucky, 1950

The integral for the parametric problem is

$$(1) \quad \int_{t_1}^{t_2} \phi(x, y, x', y') dt$$

and the minimizing curve is

$$(2) \quad \begin{aligned} x &= m(t) \\ y &= n(t) \end{aligned}$$

The usual conditions of continuity of the functions and their derivatives are assumed, with the possibility that the interval (t_1, t_2) may be broken into a finite number of sub-intervals for values of t intermediate between t_1 and t_2 for which $m'(t)$, $n'(t)$, one or both, may be discontinuous.

Certain definitions are given to aid in an understanding of the problem.

Parametric representations which represent the entire curve joining points 1 and 2 are called acceptable parametric representations.

Choosing or determining values t_1 and t_2 of t which correspond to the points 1 and 2 is called a parametric choice of the first kind.

Choosing or determining a function $x = a(t)$ to represent some curve is called a parametric choice of the second kind.

A curve whose parametric representation is a solution of a differential equation is called a characteristic curve.

The rectangular representation of the characteristic curve is the characteristic equation.

A second order, first degree differential equation

$$(3) \quad f(x, x', x'', y, y', y'', t) = 0$$

is independent of a parameter choice of the second kind if the elimination of the parameter from any of its solutions always gives the same characteristic equation.

Several theorems follow.

Theorem I: If a differential equation is independent of a parameter choice of the second kind, any parametric representation of its characteristic equation is a solution of the differential equation.

Theorem II: Two differential equations of the forms

$$(4) \quad \begin{aligned} Ax'' + By'' + C &= 0 \\ Dx'' + Ey'' + F &= 0 \end{aligned}$$

where A, B, C, D, E, F are functions of x, y, x', y', t, are dependent if and only if the matrix

$$(5) \quad \begin{vmatrix} A & B & C \\ D & E & F \end{vmatrix}$$

is of rank one.

Let

$$(6) \quad t = r(\tau) \quad \text{and} \quad \tau = \rho(t)$$

be a function and its unique inverse, both having first and second order derivatives. Applied to (3), it becomes

$$(7) \quad \psi(\tau) R(x, \frac{dx}{d\tau}, \frac{d^2x}{d\tau^2}, y, \frac{dy}{d\tau}, \frac{d^2y}{d\tau^2}, \tau) = 0,$$

in which $\psi(\tau)$ may be the constant one.

Theorem III: If the differential equation (3) is subjected to a transformation of the form of (6) and the following identity is satisfied

$$(8) \quad f(x, x', x'', y, y', y'', t) = R(x, x', x'', y, y', y'', \tau),$$

with τ replaced by t in R, then (3) is independent of a parameter choice of the second kind.

Theorem IV: If a differential equation of the form (3) is independent of a parameter choice of the second kind and is subjected to a transformation of the form (6), then the resultant equation will be such that, with τ replaced by t, every one of its solutions will be a solution of (3), and vice versa.

The minimizing arc being of form (2) it is necessary that (2) be a solution of the Euler equations

$$(9) \quad \begin{aligned} \phi_{x'x'}x'' + \phi_{x'y'}y'' + \phi_{x''x''}x'' + \phi_{x''y''}y'' - \phi &= 0, \\ \phi_{y'x'}x'' + \phi_{y'y'}y'' + \phi_{y''x''}x'' + \phi_{y''y''}y'' - \phi &= 0. \end{aligned}$$

There are three cases related to the solution of equations (9).

Case I: The independent Euler equations generally yield a solution of the form

$$(10) \quad \begin{aligned} x &= m(t, a, b, c, d) \\ y &= n(t, a, b, c, d). \end{aligned}$$

Substituting the values of t, x, y at the points 1 and 2, we can usually determine the constants a, b, c, d, and thus a unique curve passing through the points 1 and 2.

Note. These equations are number (13) in the abstract.

Case II: The dependent Euler equations (9) determine a unique curve.

Case III: Equations (9) fail to give a unique curve and this is called a singular case.

When the points are $1(x_1, y_1)$ and $2(x_2, y_2)$ the three cases above become:

Case I: The solution of the Euler equations is of the same form as before, i. e., equations (10).

Case II: The solution of the Euler equations is of the same form as in Case II above, that is, the solution is of the form

$$\begin{aligned} x &= m(t, a, b) \\ y &= n(t, a, b). \end{aligned}$$

Case III: This is a singular case.

Microfilm \$2.50; Xerox \$3.00. 47 pages.

ON THE SCEDASTIC CURVE OF A COMPOUND SURFACE

(L. C. Card No. Mic 60-1227)

Charles Latham Riggs, Ph.D.
University of Kentucky, 1949

A statistical analysis of a set of observations which tend to group themselves about means that do not coincide or observations of materials which are not homogeneous frequently leads one to a consideration of asymmetric or multimodal correlation surfaces. Such a skewed surface may be regarded as a compound surface, that is, one consisting of two or more surfaces.

A compound surface may be studied more effectively if it is dissected into component parts which are normal correlation surfaces. In this paper we shall be working with a compound surface which is the sum of two normal correlation surfaces. We shall assume that the distribution is composed of N observations, N_1 of which belong to the first component, N_2 to the second. We have then,

$$NF(x, y) = N_1 \phi_1(x, y) + N_2 \phi_2(x, y)$$

$$\text{or putting} \quad p = \frac{N_1}{N}, \quad q = \frac{N_2}{N}$$

$$F(x, y) = p \phi_1(x, y) + q \phi_2(x, y)$$

where $\phi_1(x, y)$ and $\phi_2(x, y)$ are the equations of the normal components.

We will denote any moment of the x's for a given value of y by $\mu_n(x)_y$, standard deviation by $\sigma_y(x)$, skewness by $S_y(x)$, and excess by $E_y(x)$.

The expressions for these characteristics are then:

$$(1) \quad \bar{X}_y = \frac{\int_{-\infty}^{\infty} x F(x, y) dx}{\int_{-\infty}^{\infty} F(x, y) dx}$$

$$(2) \quad \sigma_y^2(x) = \frac{\int_{-\infty}^{\infty} (x - \bar{X}_y)^2 F(x, y) dx}{\int_{-\infty}^{\infty} F(x, y) dx}$$

$$(3) \quad S_y(x) = \frac{-\int_{-\infty}^{\infty} (x - \bar{x}_y)^3 F(x, y) dx}{2\sigma_y^3(x) \int_{-\infty}^{\infty} F(x, y) dx}$$

$$(4) \quad E_y(x) = \frac{\int_{-\infty}^{\infty} (x - \bar{x}_y)^4 F(x, y) dx}{8\sigma_y^4(x) \int_{-\infty}^{\infty} F(x, y) dx}$$

$$(5) \quad \mu_n(x)_y = \frac{\int_{-\infty}^{\infty} (x - \bar{x}_y)^n F(x, y) dx}{\int_{-\infty}^{\infty} F(x, y) dx}$$

From equation (1) one obtains the so-called regression of means; from (2), the curve of scedasticity; from (3), the curve of clisy; from (4), the synagic curve; and the graph of $\mu_n(x)_y$ gives the curve of regression of that moment.

We shall use m_{11} and σ_{11} to indicate the mean and standard deviation of the x 's in the first normal component of our compound surface, m_{12} and σ_{12} to indicate the same characteristics of the x 's in the second normal component. The symbols m_{21} , σ_{21} , m_{22} , σ_{22} will indicate the corresponding characteristics of the y 's in the first and second components. Finally, r_1 will indicate the correlation between the x 's and y 's in the first component, r_2 the correlation between the x 's and the y 's in the second component.

Using this notation we have

$$\varphi_1(x, y) = \frac{1}{2\pi \sigma_{11} \sigma_{21} \sqrt{1-r_1^2}} e^{-\frac{1}{2(1-r_1^2)} \left[\left(\frac{x-m_{11}}{\sigma_{11}} \right)^2 - 2r_1 \left(\frac{x-m_{11}}{\sigma_{11}} \right) \left(\frac{y-m_{21}}{\sigma_{21}} \right) + \left(\frac{y-m_{21}}{\sigma_{21}} \right)^2 \right]}$$

and $\varphi_2(x, y)$ a similar function with corresponding constants defined above. Substituting this in equation (1) and integrating we have

$$\bar{X}_y = P(m_{11} + r_1 \sigma_{11} \eta_1) + Q(m_{12} + r_2 \sigma_{12} \eta_2)$$

where

$$\eta_1 = \frac{y - m_{21}}{\sigma_{21}}, \quad \eta_2 = \frac{y - m_{22}}{\sigma_{22}}$$

$$P = \frac{\frac{p}{\sqrt{2\pi} \sigma_{21}} e^{-\frac{1}{2}\eta_1^2}}{\frac{p}{\sqrt{2\pi} \sigma_{21}} e^{-\frac{1}{2}\eta_1^2} + \frac{q}{\sqrt{2\pi} \sigma_{22}} e^{-\frac{1}{2}\eta_2^2}}$$

and

$$Q = 1 - P.$$

By definition, the generating function about an arbitrary origin is

$$G_{xy}(\theta) = \frac{p \int_{-\infty}^{\infty} \varphi_1(x, y) e^{x\theta} dx + q \int_{-\infty}^{\infty} \varphi_2(x, y) e^{x\theta} dx}{\int_{-\infty}^{\infty} F(x, y) dx}$$

Therefore

$$G_{xy}(\theta) = p e^{(m_{11} + r_1 \sigma_{11} \eta_1)\theta + \sigma_{11}^2 (1-r_1^2) \theta^2/2} + q e^{(m_{12} + r_2 \sigma_{12} \eta_2)\theta + \sigma_{12}^2 (1-r_2^2) \theta^2/2}$$

Defining

$$\delta = (m_{11} + r_1 \sigma_{11} \eta_1) - (m_{12} + r_2 \sigma_{12} \eta_2) = \delta_1 - \delta_2$$

$$-S_1^2 = \sigma_{11}^2 (1 - r_1^2)$$

$$-S_2^2 = \sigma_{12}^2 (1 - r_2^2)$$

and translating the origin to the mean of the x 's for a fixed y we have

$$G_{xy-\bar{x}_y}(\theta) = P e^{\delta Q \theta - S_1^2 \theta^2/2} + Q e^{-\delta P \theta - S_2^2 \theta^2/2}$$

We may write the generating function about the mean of the x 's as

$$G_{xy-\bar{x}_y}(\theta) = e^{\delta Q \theta - S_1^2 \theta^2/2} \{P + Q e^{\tau}\}$$

$$\text{where } b = S_1^2 - S_2^2 \quad \text{and} \quad \tau = -\delta \theta + b \theta^2/2$$

Now let $\lambda_1, \lambda_2, \dots, \lambda_n, \dots$ be the Thiele semi-invariants of the x 's for a given y . Then

$$\begin{aligned} \sum_{k=1}^{\infty} \lambda_k \frac{\theta^k}{k!} &= \log G_{xy-\bar{x}_y}(\theta) \\ &= (\delta Q \theta - S_1^2 \theta^2/2) + \log(P + Q e^{\tau}) \end{aligned}$$

Here we note that $\log(P + Q e^{\tau})$ is equal to $\frac{1}{n}$ times the logarithm of the generating function for a Bernoulli distribution with $p = Q$ and $q = P$. We therefore let $L_1, L_2, \dots, L_n, \dots$ be the semi-invariants of the binomial distribution each divided by n and having p replaced by Q, q by P . For example,

$$L_1 = Q$$

$$L_2 = PQ$$

$$L_3 = PQ(P - Q)$$

$$L_4 = PQ(1 - 6PQ)$$

Hence we have

$$\sum_{k=1}^{\infty} \lambda_k \frac{\theta^k}{k!} = \delta Q \theta - S_1^2 \frac{\theta^2}{2} + \sum_{k=1}^{\infty} L_k \frac{\tau^k}{k!}$$

Let

$$R = \sum_{k=1}^{\infty} L_k \frac{\tau^k}{k!}$$

Then one can show for n even

$$\begin{aligned} \frac{d^n R}{d\theta^n} \Big|_{\theta=0} &= (-\delta)^n L_n + \binom{n}{n-2} b (-\delta)^{n-2} L_{n-1} \\ &+ 1 \cdot 3 \binom{n}{n-4} b^2 (-\delta)^{n-4} L_{n-2} \\ &+ \dots + 1 \cdot 3 \cdot 5 \dots (n-1) b^{n/2} L_{n/2} \end{aligned}$$

and in the same way, when n is odd

$$\begin{aligned} \frac{d^n R}{d\theta^n} \Big|_{\theta=0} &= (-\delta)^n L_n + \binom{n}{n-2} b (-\delta)^{n-2} L_{n-1} \\ &+ 1 \cdot 3 \binom{n}{n-4} b^2 (-\delta)^{n-4} L_{n-2} \\ &+ \dots + 1 \cdot 3 \cdot 5 \dots (n) (-\delta) b^{[n/2]} L_{[n/2]+1} \end{aligned}$$

From equation (9) we have

$$\lambda_1 = 0, \quad \lambda_2 = -S_1^2 + bQ + \delta^2 PQ,$$

$$\lambda_n = \frac{d^n R}{d\theta^n} \Big|_{\theta=0} \quad \text{for } n > 2$$

Therefore we have the semi-invariants of the y-arrays of the compound surface given in terms of the characteristics of the normal components.

From these semi-invariants we have then for the curve of scedasticity of x on y

$$\mu_2(x)_y = PQ\delta^2 - PS_1^2 - QS_2^2$$

for the curve of clisy

$$\mu_3(x)_y = PQ\delta\{3(S_2^2 - S_1^2) - (P - Q)\delta^2\}$$

and for the synergic curve

$$\begin{aligned}\mu_4(x)_y = & PQ(1 - 3PQ)\delta^4 + 3(PQS_1^4 + PQS_2^4 + P^2S_1^4 + Q^2S_2^4) \\ & - 6PQ\delta^2(QS_1^2 + PS_2^2)\end{aligned}$$

The curves of regression of higher moments may be found similarly.

The following theorems were then proved:

Theorem 1: The n^{th} moment about the mean of the x's, μ_n , can be expressed in terms of Hermite Polynomials by

$$\mu_n = PS_1^n H_n\left(\frac{-\delta Q}{S_1}\right) + QS_2^n H_n\left(\frac{\delta P}{S_2}\right)$$

Theorem 2: The n^{th} moment about the scedastic curve of the x's for a given y, μ_n'' , can be expressed in terms of Hermite Polynomials by

$$\mu_n'' = PS_1^n H_n\left(\frac{\mu_2 - \delta_1}{S_1}\right) + QS_2^n H_n\left(\frac{\mu_2 - \delta_2}{S_2}\right)$$

Theorem 3: The generating function of the moments about the scedastic curve is expressible in terms of generating functions of Hermite Polynomials as

$$\begin{aligned}G_{xy-\mu_2}(\theta) = & P \sum_{k=0}^{\infty} H_k\left(\frac{\delta_1 - \mu_2}{S_1}\right) \frac{(S_1\theta)^k}{k!} \\ & + Q \sum_{k=0}^{\infty} H_k\left(\frac{\delta_2 - \mu_2}{S_2}\right) \frac{(S_2\theta)^k}{k!}\end{aligned}$$

An application was made to a particular surface in which the third moment about the scedastic curve is computed directly from the surface and also from Theorem 2. A comparison of the values of μ_3'' computed from the surface and the corresponding theoretical μ_3'' show them to be in excellent agreement.

Microfilm \$2.50; Xerox \$3.00. 41 pages.

SOME RESULTS ON EXPERIMENTAL DESIGNS WHEN THE USUAL ASSUMPTIONS ARE INVALID

(L. C. Card No. Mic 60-623)

Hale Caterson Sweeny, Ph.D.
Virginia Polytechnic Institute, 1956

In the derivation of the theory of the analysis of variance, as related to complete block experimental designs, several assumptions are made: (1) the various ef-

fects contributing to the size of an observation act in an additive manner, (2) the errors associated with a complete block have jointly a multivariate normal distribution with zero means and variance-covariance matrix Σ , and (3) Σ has the form $\Sigma = I\sigma^2$, where I is the identity matrix. This last assumption is usually considered as two separate assumptions--independence of error terms and homogeneity of error variances. When the treatments to be tested constitute a set of factorial treatments, it is further assumed that, (4) the levels of the treatments are known without error. The work reported herein is divided into three parts. In the first part, tests of significance for the hypothesis of homogeneity of means are developed for four alternate cases concerning Σ . These four cases are: (1) Σ may be of any form, but Σ is known. (2) A matrix proportional to Σ is known; the constant of proportionality being unknown. (3) All diagonal terms in Σ are equal and all off-diagonal terms in Σ are equal, the values of the terms being unknown, and (4) Σ has an unknown general form.

To derive these tests, the multivariate sample is first subjected to a transformation affected by subtracting one of the variates in the vector of observations from the rest of the variates. This reduces the composite hypothesis of homogeneity of means to a simple hypothesis. The tests are then derived by the likelihood ratio approach. It is shown that the resulting tests are more general than first supposed, being applicable when block effects are present. In the first three cases, the tests are compared with the tests which can be derived in the absence of block effects to show power equalities.

The tests are then applied to the randomized block design, the Latin square design, and the split plot design. For the randomized block design, a study is made of the loss in power incurred in assuming case (4), when the assumptions of the usual analysis of variance should have been made.

The second part of the dissertation is concerned with assumption (4). Berkson has shown that if the independent variables are of the type known as "controlled" variables, then coefficients in a simple linear regression model may be estimated without bias by the usual least squares formulae. This work was extended by Geary to polynomial regression. A theorem is proved to the effect that only two of the coefficients in a univariate polynomial regression may be estimated in an unbiased way by the use of least squares. Extensions to multivariate situations and to factorial designs are noted, especially in connection with the estimation of minima or maxima points in a response surface study.

In the third part of this work, the effects of a non-additive model in an unreplicated factorial experiment are studied. It has been suggested in the literature that in analyzing unreplicated factorial experiments, estimates of error may be obtained from higher order interactions. It is shown that if the data arises from a multiplicative model, this procedure may lead to entirely erroneous conclusions being drawn from a straightforward analysis of the data. Microfilm \$2.50; Xerox \$5.80. 118 pages.

MUSIC

A COMPARATIVE STUDY OF EXISTING MANUSCRIPTS AND EDITIONS OF THE ROBERT SCHUMANN SONATA IN F SHARP MINOR, OPUS 11, FOR PIANO.

(L. C. Card No. Mic 60-1059)

Dean Elmer Boal, D.Mus.A.
University of Colorado, 1959

Supervisor: Professor Storm Bull

This thesis on Robert Schumann's sonata in F sharp minor, Opus 11, for piano, is the result of an historical, analytical, and comparative study of early manuscripts and of three basic editions of the sonata--those by Clara Schumann, Eduard Schütt, and Harold Bauer.

These manuscripts and editions have been compared in order to bring to light errors which have come about through carelessness in engraving and inconsistency in editing. The editions are not offensively inaccurate. However, the editors did not use all the manuscripts which are extant. The problem has been one of reconciling the discrepancies in the manuscripts and editions. Also, subjective judgments concerning controversial portions of the sonata necessitated some arbitrary conclusions; these have been designated in the thesis.

The study has proceeded from a selective history and analysis of the sonata to a substantiation of changes made in the editions. The results of the study have been consummated in a new edition which is practical as well as scholarly. Through this thesis, the writer intends to suggest new insights into the phrasing, structural design, and general expressiveness of the sonata.

Microfilm \$2.50; Xerox \$4.40. 82 pages.

RELATIONSHIPS OF PIANO TRAINING TO ABILITY OF 205 ELEMENTARY TEACHERS IN CARRYING ON CLASSROOM MUSIC ACTIVITIES IN MARYLAND

(L. C. Card No. Mic 60-1279)

Mary Viola Formwalt de Vermond, Ed.D.
University of Maryland, 1959

Supervisor: Dr. Kenneth O. Hovet

Purpose of the Study

The purpose of the study is to examine relationships between piano training and ability of elementary teachers in carrying on classroom music activities.

Procedures

From a population of 7,700 elementary classroom teachers in Maryland in 1958-1959, a self-weighting sample

of 253 teachers, representing 104 schools and 15 counties was drawn. The 104 schools were selected by use of a table random numbers. Systematic sampling with random starts was used in drawing teachers from schools of various sizes. The overall sampling ratio was 1:30.

A questionnaire was devised which included: general information about the teachers and teaching positions; training and experiences in music; extent of piano training and its use and value in classroom music activities; and teacher-evaluations of abilities in classroom music activities. The questionnaire was returned by 205 teachers (81 percent) from 100 schools.

The Sample

The 205 teachers ranged in age from 21 to 63 years and had an average age of 37 years. Bachelor's degrees were held by 69 percent and Master's degrees by 13 percent. Teachers of grades from kindergarten through the sixth grade were represented. The average class size was 33 pupils. Teaching experience ranged from one to 39 years with an average of approximately ten years.

The Findings

Of the 205 teachers, 143 (70 percent) had piano training. Although the term "piano training" was defined to be nine weeks or more of study, the average length of training was three years. Among the 143 teachers with piano training, 73 percent desired more use of the piano in classroom music activities. Of the 62 teachers with no piano training, 74 percent believed, as a result of their teaching experience, that piano training would have been valuable preparation for classroom music activities. Ninety-two percent of teachers with piano training found it helpful to some degree.

When responses of 205 teachers were considered, 91 percent believed that use of piano classroom music activities was desirable. Seventy-five percent of the teachers expressed a current desire for piano lessons.

The 205 teachers were asked to evaluate their ability in carrying on music activities in classrooms. Of the 143 teachers with piano training, 28 percent rated themselves as above average while only six percent of the teachers with no piano training considered their abilities above average. This difference was found to be significant at the one per cent level of probability.

By a chi square test for association between the number of years of piano training and the self-evaluations of ability in music activities, a significant relationship was found at the .001 level of probability.

In singing activities, it was found that 90 percent of the teachers with piano training expressed some degree of enjoyment as contrasted with 81 percent of the teachers with no piano training. This difference was found to be significant at the five percent level of probability.

Of 39 teachers who rated themselves as above average in some of the 34 skills useful in classroom music activities, 35 had some piano training.

Conclusions and Recommendations

Piano training seems to have value for elementary classroom teachers even though 89 percent of the training was of a type not specifically directed toward skills useful in school playing. Functional piano has the basic purpose of developing techniques for school and community playing. It is recommended that:

1. Functional piano training be made available during preservice or inservice study;
2. Action research be undertaken in order to develop piano skills useful in each area of elementary music activities;
3. Efforts be instituted to make pianos more available for classroom use and for personal practice of teachers.

Microfilm \$3.25; Xerox \$11.50. 251 pages.

A STUDY OF ORNAMENTS IN AMERICAN TUNE BOOKS, 1760-1800.

(L. C. Card No. Mic 60-558)

Hans Engelke, Ph.D.

University of Southern California, 1960

Chairman: Professor Kendall

This dissertation investigates systematically the ornaments used in the singing of the music contained in American tune books from 1760 to 1800. Its purpose is to eradicate all possible misconceptions that may have been formed about ornamentation in this indigenous music and to serve as a guide for prospective performers.

An effort was made to investigate every tune book of this period whose introduction contains some information on ornaments. Because embellishments are rarely found in the music, these introductions, unfortunately, comprise the only substantial body of information available on this subject. Yet from the material presented and from the many admonitions interspersed throughout the introductions, a plausible amount of information concerning the use and popularity of the ornaments can be gleaned. In

order to familiarize the reader with the type and quality of information, as well as to provide a guide for the discussion on ornaments in later chapters, a review of this material from the various tune books is given in chapter two. The sources utilized by the authors are also supplied whenever possible, being of paramount importance in determining the major influences upon American composers. The works are listed chronologically, so as to show with greater clarity the changes in the ornaments that took place over the years.

The third chapter analyzes the results of the foregoing review and presents a categorical breakdown of the tune books and their sources for the ornaments. From this the following facts are established: (1) The best material on ornaments is concentrated in a relatively few works, (2) Americans borrowed rather freely from each other and from British works, and (3) the major influence on American works as a whole was the English tune book. For a better understanding of the ornaments contained in the latter, several of the more popular British works are examined here.

Because the word ornament was used rather loosely by Americans, it was necessary to define their interpretation of that term and to determine which embellishments were meant to be included in that category. It is shown that, in addition to the trill, turn, beat, grace of transition, and appoggiatura, it included a number of characters not now classified as ornaments, but which at that time were very much considered as such. These were the ornaments of expression—the accent, mark of distinction or staccato, swell, and hold.

The major portion of this paper is devoted to a thorough investigation of these ornaments. Among the points discussed are their various interpretations, how they were to be learned, the proper places for their use, and a short historical background of each. The trill and grace of transition were undoubtedly the most popular of all the ornaments, and because of their wide and varied use, they receive the most attention here. The ornaments of expression, on the other hand, seemingly found little favor outside of the more erudite singing societies, a point reflected in the treatment accorded them by the authors of the tune books.

In conclusion, reference is made to the singing practices in the Colonies from 1700 to the period under discussion and their influence on the interpretation of the ornaments in the tune books. Several writers made mention of these singing practices, and their varying illustrations of a given ornament demonstrate to what extent this old aural folk tradition was still active during 1760-1800. Microfilm \$2.85; Xerox \$9.90. 217 pages.

PHARMACOLOGY

EFFECT OF THE THYROID ON FATTY ACID OXIDATION IN THE RAT MYOCARDIUM

(L. C. Card No. Mic 60-1063)

Richard A. Deitrich, Ph.D.
University of Colorado, 1959

Supervisor: Professor Donn L. Smith

Tachycardia and high output failure have long been recognized as clinical manifestations of hyperthyroidism, while the opposite situation is seen in clinical hypothyroidism. Previous investigators have attempted to correlate the effects of hyperthyroidism on cardiac function with the *in vitro* metabolism of myocardial tissue. Relatively little work has been done on the *in vitro* metabolism of cardiac tissue from hypothyroid animals.

Recent demonstrations that fatty acids comprise an important source of energy for the heart, coupled with the knowledge of the details of fatty acid metabolism, offered a new approach to the problem of correlating *in vitro* metabolism of the heart with *in vivo* cardiac manifestations of thyroid disease.

Conventional manometric techniques were used to determine the oxygen uptake due to added butyrate by heart homogenates obtained from euthyroid, hypothyroid, hyperthyroid and epinephrine injected albino rats. Oxygen uptake due to added butyrate was measured in three different systems: One in which malate was added as a "sparker" of fatty acid oxidation, one in which nicotinamide was added to protect the endogenous diphosphopyridine nucleotide (DPN) and one in which neither of these materials was added (endogenous system).

It was found that the addition of nicotinamide caused an increase in oxygen uptake due to added butyrate but that addition of malate had no effect. In addition it was shown that nicotinamide caused an increase in oxygen uptake in the absence of added butyrate, which is in contrast to previous results obtained in liver homogenates.

Hyperthyroidism was induced by surgical thyroidectomy, thiouracil administration or I^{131} treatment. Oxygen uptake due to added butyrate by heart homogenates from animals made hypothyroid by any method was markedly decreased in the nicotinamide system. Activity in the malate and endogenous systems was not significantly different from euthyroid controls. Oxygen uptake in the absence of added butyrate was not significantly different from euthyroid controls in any system used.

Hyperthyroidism was induced by injection of thyroxine. Oxygen uptake due to added butyrate by heart homogenates from hyperthyroid animals was greatly increased in all three systems studied. Activity in the malate system was greater than that in either of the other two systems. Oxygen uptake in the absence of added butyrate was not significantly different in any of the systems studied.

Injection of epinephrine into euthyroid animals resulted

in a marked increase in oxygen uptake due to added butyrate in all systems studied. These results were almost identical to those obtained in heart homogenates from hyperthyroid animals. Injection of epinephrine into hypothyroid or hyperthyroid animals did not result in values different from those obtained in hypothyroid or hyperthyroid animals.

It is possible that these results are due to an increase in functional DPN in heart homogenates obtained from hyperthyroid animals and a decrease in functional DPN in heart homogenates from hypothyroid animals.

It would appear that the increased ability of the hyperthyroid heart of a hyperthyroid animal to oxidize fatty acids would support the increased cardiac work present in these animals while the hypothyroid heart, unable to oxidize fatty acids, would become hypodynamic on this basis. Microfilm \$2.50; Xerox \$5.60. 115 pages.

THE EFFECT OF INNERVATION ON THE RESPONSE OF THE EMBRYONIC HEART TO DRUGS

(L. C. Card No. Mic 60-1010)

Leslie Paul McCarty, Ph.D.
University of Wisconsin, 1960

Supervisor: Professor Frederick E. Shideman

Part I. THE ISOLATED EMBRYONIC CHICK HEART AND THE EFFECT OF CHEMICAL MEDIATORS.

A method was developed for photoelectrically recording the contractile force, tone and rate of the isolated embryonic chick heart. Under the conditions employed, hearts from embryos of various ages exhibited rates comparable to those recorded for the intact heart *in situ*. Within certain limits, the four day-old, noninnervated embryonic heart displayed contractile characteristics of the adult heart, i.e. an increase in diastolic tension resulted in an increase in contractile force. Utilizing a compound, 1-(3,4-dichlorophenyl)-2-isopropylaminoethanol hydrochloride, capable of specifically blocking the adrenergic receptors in the heart, it was shown that epinephrine and norepinephrine exert their effects on the noninnervated heart by interaction with these receptors rather than by direct stimulation of the myocardium. The sensitivity of these receptors to epinephrine does not change upon innervation. Acetylcholine exerts its characteristic action on the noninnervated heart and its sensitivity to this drug does not change upon innervation. The receptors for the chemical mediators in the myocardium are present and fully functional before the entrance of extrinsic nerves. Physostigmine potentiated the inotropic and chronotropic responses to acetylcholine in the four day-old heart but

not in the three day-old heart indicating a lack of cholinesterase activity on the third but not on the fourth day of incubation.

Part II. THE CARDIOSTIMULANT ACTION OF CERTAIN GANGLIONIC STIMULANTS ON THE EMBRYONIC CHICK HEART.

Nicotine exhibited a marked positive inotropic action on the noninnervated chick heart, an action which was not significantly modified by innervation. Similar cardiostimulant responses were produced by tetramethylammonium and acetylcholine in the atropinized chick heart. These responses were blocked by dichloroisoproterenol indicating the participation of the adrenergic receptors in these actions. These effects of the ganglionic stimulants are also blocked by trimethyl[2-(2,6-xylyloxy)propyl]ammonium chloride, (SKF 6890-A), a substance which prevents the release and/or synthesis of the adrenergic mediators. A small, but significant, quantity of catecholamines was found to be present in the four day-old embryonic heart by a spectrophotofluorometric technic. The available evidence indicates that the cardiostimulant actions of nicotine and the other ganglionic stimulants studied are related to their capacity to release epinephrine-like substance(s) from a site(s) in the heart which is(are) not associated with extrinsic nerves.

Part III. THE MECHANISMS FOR TERMINATING THE ACTIONS OF EPINEPHRINE IN THE EMBRYONIC CHICK HEART.

Prolonged positive inotropic and chronotropic responses of the four day-old embryonic chick heart were observed when it was exposed to epinephrine. These responses could be abolished only by repeated washing of the tissue. On the other hand, similar effects of epinephrine on the six day-old heart were easily reversed by a single washing. The four day-old embryonic heart had little or no capacity to metabolize epinephrine; six day-old hearts metabolized significant quantities, and fifteen day-old hearts had an even greater capacity to metabolize catecholamines. Pyrogallol (10^{-4} M), an inhibitor of catechol-O-methyl transferase, produced a significant degree of inhibition of epinephrine metabolism by fifteen day-old hearts while iproniazid (10^{-4} M), an inhibitor of monoamine oxidase, exhibited no such activity. On the basis of these results, it appears that the major metabolic pathway for epinephrine in the fifteen day-old embryonic chick heart involves the participation of catechol-O-methyl transferase and that the mechanism for termination of the action of catecholamines is by their metabolism to inactive compounds. All four day-old and certain six day-old embryonic hearts, after incubation with high concentrations of epinephrine, were less responsive to a second exposure to the drug. It is therefore possible that a second mechanism, partial tolerance, is present for terminating the action of epinephrine in preparations which do not possess a metabolic system(s).

Microfilm \$2.50; Xerox \$5.20. 105 pages.

PHILOSOPHY

THE CONCEPT OF A PHYSICAL OBJECT: ITS ROLE IN THOUGHT AND LANGUAGE.

(L. C. Card No. Mic 60-916)

Patricia Ann Crawford, Ph.D.
University of Minnesota, 1959

Prima facie, common sense claims that physical objects (I) are sense perceivable, (II) exist independently, both logically and causally, of whether they are perceived or observed by any being, and (III) have a continuous existence even when not perceived by any being. The task of the thesis is to examine the grounds and status of the contention that there are particulars which are characterized by (I), (II), and (III). I call this contention realism and distinguish two aspects of realism: (A) Realistic epistemology: the contention that there are independent and continuously existing particulars which are sense perceivable and (B) Realistic metaphysics: the contention that there are physical objects having continued and independent existence.

I do not claim to show that the realistic epistemology is correct, but I do claim to show that the arguments which have usually been brought against that position do not force

its abandonment. Following Kant I distinguish between direct proof and transcendental proof; between deductive theorems and inductively confirmable propositions and framework principles.¹ The major contention for which I argue is that the theses of realistic metaphysics cannot be directly proved; they can only be given a transcendental proof. I thus defend in contemporary terms and against contemporary criticisms a thesis which is essentially found in Kant and partly in Hume. Hume quite clearly recognized that such principles could not be given a direct proof. Kant agreed with Hume on this point, but whereas Hume concluded that such principles are therefore unjustified beliefs, Kant claimed that such principles are justified by a transcendental proof. My defense of the Kantian thesis has two parts: (I) I examine transcendental arguments which may be given for the realistic metaphysics and (II) I argue that no valid direct proof can be given for the realistic metaphysics. I distinguish between two types of attempted direct proofs of the realistic metaphysics: (1) those which provide a framework other than the realistic framework within which to attempt to prove the realistic metaphysics and (2) those which fail to provide a framework other than the realistic metaphysics within which to attempt to prove the realistic metaphysics. I

show that all attempted direct proofs of type (2) are invalid because they presuppose the very thing which they attempt to prove. To completely substantiate my thesis I should then show that it is impossible to provide a framework other than the realistic framework within which the realistic metaphysics may be proved. I do not do this; however I do examine the one framework, phenomenalism, which has been put forward as a framework within which realism functions as an inductively confirmed hypothesis and I show that this attempt to give a direct proof of the realistic metaphysics fails.

In conclusion, I examine the implications of the foregoing for the Kantian position of empirical realism and transcendental idealism. My conclusion is that the only conclusive proof of transcendental idealism is the antinomies. If the antinomies can be given a non-Kantian solution then, as far as the foregoing is concerned, we simply cannot give any justifiable answer to the external² question of the metaphysical reality of objects having continued and independent existence. With respect to the question of the metaphysical reality of such objects we must either adopt the position of transcendental agnosticism or we must take Carnap's position that the question and answers to it are simply meaningless.

Microfilm \$2.50; Xerox \$6.80. 144 pages.

1. See Carnap, Rudolph: "Empiricism, Semantics, and Ontology" in Linsky, L: Semantics and the Philosophy of Language, University Illinois Press, 1952.

2. Ibid.

ABSTRACT ENTITIES

(L. C. Card No. Mic 59-3189)

Ash Ghobar, Ph.D.

The University of Wisconsin, 1959

Supervisor: Professor Julius Weinberg

The objective of this thesis is to examine the ontological and epistemological status of abstract entities. Throughout the thesis the distinction between the abstract and the concrete is kept clear. A concrete entity is defined as any entity that exists within the framework of space and (or) time. Thus both physical objects and psychological entities are concrete. An abstract entity is defined as any entity that exists, if at all, outside the framework of space and time. The word "metaphysical" is here taken literally and equated with the word "abstract". Thus abstract entities, if any, are metaphysical objects. It is pointed out that existence is not a property and, not being a property, is not confined to any other kind of entities. It is also pointed out that the appeal to the principle of (empirical) verification, here, is irrelevant: The issue being, not whether non-empirical entities are empirically confirmable, but whether there are any entities that are not empirically confirmable.

The approach adopted by this thesis consists of the philosophical analysis, with the aid of logical methods exclusively, of the logical evidence for the existence of abstract entities. There are three main theories that claim to present such evidence: The theory of ideas (Plato), the

theory of metaphysical objects (Frege), and the theory of ontological commitment (Alonzo Church and W. V. Quine). The first two theories hypostatize abstract entities as a necessary precondition for the explanation of certain aspects of our experience and our knowledge (theoretical sciences); the last theory is concerned with the ontological presuppositions of certain forms of language. A separate chapter is devoted to the examination of each theory.

The results of this examination are: (1) None of these theories of abstract entities are free from serious problems. The potentialities of the theory of ideas are pressed to solve some of its classic problems, but the problem of participation remains unsolved. The theory of metaphysical objects faces two main problems--the problem of the relation of falling (of an object) under (a concept), and the problem of the epistemology of metaphysical objects. As for the theory of ontological commitment, one of its criteria is found defective (because it requires the proposition, which is the smallest unit of sense, to be split--by treating the operand of the quantifier in isolation from its repeated appearance in the matrix), and the other inconclusive (because it does not establish the existence of abstract entities, but merely shows them to be assumed by certain forms of language). (2) Despite the faults of the theories, abstract entities cannot be renounced outright. These theories have at least called attention to serious problems in our experience of phenomena, in the sciences, and in the use of language, which point toward a metaphysical ontology: The problems of the judgment of resemblance, the nature of numbers, concepts (including the concept of class), the transfinite set, the proposition (thought), and our frequent reference to abstract entities without admitting their existence. It is concluded that the choice between a purely phenomenalist theory, a conceptualist theory, and a metaphysical theory is not an arbitrary one: The question is what portion of the universe and our knowledge we want to explain, and, considered in this light, the apparent rivalry of these theories subsides and their explanatory power becomes the mark of their value. (3) In the concluding chapter: (i) A possible line of solution to the problem of the nature of the relation of falling (of an object) under (a concept) is outlined on the basis of the concept of logical-structure. (ii) An implication of the results of this thesis for the concepts of psychology is noted.

Microfilm \$2.50; Xerox \$8.80. 192 pages.

A CRITERION FOR THE EVALUATION OF A PROGRAM FOR CHARACTER EDUCATION

(L. C. Card No. Mic 60-1093)

Henry Kauffman, Ph.D.

New York University, 1959

Problem and Limits

The problem of the thesis is to develop, refine, and present a criterion for the evaluation of any program for the development of personality and character.

The dissertation makes extensive use of the findings of the psychologists of personality and character but is not a psychological study. It is primarily a philosophical treatment of the materials provided by the psychologists.

Procedure

The writings of forty qualified authors in the field of personality and character development are analyzed to determine the factors which they believe control human behavior. Ten determinants of personality and character are disclosed by the analysis: biogenic factors, nonpersonal or cultural factors, interpersonal relations, learning or conditioning, personal response, ideas, ideals, sustaining values, association with inspiring personalities, and relation to ultimate reality.

On the basis of statements from their own works, it is then shown what determinants each of the forty authors utilizes and to what extent. This information is then charted, H indicating heavy emphasis, M moderate emphasis, and L little or no emphasis.

By the use of the historical-descriptive method it is shown that the forty authors being studied build their theories on unproven suppositions. Five groups of such presuppositions are distinguished, three philosophical and two psychological. These five categories are listed as naturalistic, humanistic, transcendental, "Lockean", and "Leibnitzian".

The method of concomitant variation is used to show that when the category of presuppositions differs, the choice of determinants changes.

Findings and Conclusions

The conclusion is drawn that the choice of determinants is not based on scientific or logical grounds but results from the unproven assumptions of the theorists.

There is strong evidence to support the recognition of each of the ten determinants revealed by the study and no sound justification for ignoring any of them. The suggestion is therefore made that any program for personality or character development should make room for the use of all ten determinants. This is the criterion proposed for evaluating plans for personality or character development. Proof of the validity of any or all of the determinants suggested can come only by testing them by using them in a carefully planned program for personality or character development.

Any such program is too extensive to be carried out by the individual, the home, religious institutions, school, or community alone. All must help in a cooperative project. One group will find that it has a better opportunity to utilize certain determinants than other groups. Thus the religious institutions can seek commitment to ultimate reality while the public school cannot do so on the basis of law or justice.

Each individual and each group is thus challenged to make the best possible contribution to personality and character development and become a cooperating agency for the discovery of the validity of known and yet to be discovered factors in the process of developing moral and spiritual values.

Microfilm \$3.00; Xerox \$10.35. 230 pages.

AN ANALYSIS AND COMPARISON OF THE CONCEPT OF SOCIAL-SELF-REALIZATION IN THE RECONSTRUCTIONIST AND ETHICAL CULTURE PHILOSOPHIES

(L. C. Card No. Mic 60-1100)

Grace Kipp Pratt, Ph.D.
New York University, 1959

The purpose of this study is to analyze and compare the concept of social-self-realization in the Reconstructionist philosophy and in Ethical Culture theory. Social-self-realization, the key axiological principle is hypothesized for this purpose. The major hypothesis is that social-self-realization is equivalent in both positions.

In order to prove this, a systematic examination of the data is made, and compiled in chapters dealing with value, self, and society, the components of social-self-realization. Since social-self-realization is as yet unattained, imperatives necessary to its achievement are formulated as requisite bases for the moral "ought." Proof that both philosophies contain such an implicit "ought" forms part of the findings. Implications of the moral "ought" for the educational institutions advocated by Ethical Culture and Reconstructionism are examined. The last part of the study consists of an analysis and comparison of the two views of social-self-realization, based on the findings.

Generally speaking, Reconstructionism and Ethical Culture are alike in their anthropocentric emphasis, in their advocacy of definite purpose, and in stating that a form of unity is achievable in their goal. Human action is the instrument for universal realization in both its practical and ideational aspects. Action is evidenced in will, choice, developing experience, and interaction directed toward the changes necessary to achieve a more satisfactory present and future. Group problem-solving, utilizing social consensus, is explicit in much Reconstructionism and implicit in much Ethical Culture theory. Both philosophies seek to resolve the problem of unity and plurality through normative commitment to a society in which there is maximum realization.

Six basic distinctions are discovered in the concepts of the two philosophies. The first is in the status of ontological and axiological agreement. The basic ontological agreement in Reconstructionism supports a unified axiological basis for social-self-realization, whereas the lack of a unified ontology in Ethical Culture nurtures axiological difference which is reflected in the concept of social-self-realization. The second distinction is found in the fact that all Reconstructionists define man as a natural-social organism, whereas the Ethical Culture Leaders do not define man but attribute worth to him. The third distinction revolves around the nature of "rights," as the already present and active natural-cultural imperative of man's wants, in Reconstructionism, and "duty," as an initial valuing act, required of the Ethical Culture member. This requires the focussing of thought and effort upon a future goal for what now is, in Reconstructionism, and of an active agent to develop an underlying faith in what should be, in Ethical Culture. The fourth distinction lies in two concepts of meliorism. For all Reconstructionists, melioristic factors are derived from a theory of cultural evolution holding that man has an excellent chance to realize a more perfect society; whereas Ethical Culture Leaders, on varying grounds,

hold that man's future will inevitably be better. The fifth distinction is in the discernible emphasis on the importance of society in Reconstructionism and on the self in Ethical Culture. Sixth, there is a distinction in the meaning of social-self-realization itself. In Reconstructionism it represents agreement about maximum realization, the summum bonum of the natural-social-experiential continuum, whereas in Ethical Culture, social-self-realization is a broad manifold, inclusive of maximum variety, but less precise and not revealing, to any great extent, its final nature. We conclude that the Reconstructionist and Ethical Culture philosophies, although very similar in important respects, do have certain important differences. They could gain valuable support from each other.

Microfilm \$5.85; Xerox \$20.75. 457 pages.

GEORGE BERKELEY'S THEORY OF LANGUAGE

(L. C. Card No. Mic 60-1256)

Rena Josephine Ratte, Ph.D.
Duke University, 1959

Supervisor: Bernard Peach

This dissertation attempts to fill some of the gaps in the Berkeleyan theory of language though not to offer a complete theory. The account offered is consistent with the two main theses of the Berkeleyan philosophy: that there are no absolute and independent material objects and that there are no abstract entities. The account of concrete singular terms is consistent with the first thesis, while the account of abstract singular terms, though not complete, is consistent with the second.

We employ Berkeley's analysis of physical objects as given in the *Essay Towards a New Theory of Vision*. Berkeley claims that each sense has proper objects, objects which are perceived only by that sense, and that there are no objects common to the senses. Since the criterion of existence is perception, the proper object thesis assures Berkeley a commitment only to the existence of sounds, tastes, odors, feelings and views, but not to a material substratum or to a material object not analyzable in terms of proper objects.

I interpret Berkeley to hold that immediate perception is the non-interpretative perception of proper objects, while mediate perception is the interpretative perception of physical or mediate objects. The relationship between proper objects and mediate objects is then explicable in terms of the sign system called the Divine Visual Language in which proper objects are used as signs and, as signs, associated with other objects through their signification. The signification is given in terms of the actions a perceiver must perform in order to experience the associated objects. The mediate object is analyzed into the proper object used as a sign and into the sign's signification which relates the sign object to its associated objects. Our psychological inability to separate the sign from its signification results in our perceiving the sign object as a mediate object. Mediate objects serve as referents of singular terms in ordinary language, and these terms have a connotation which is a conjunction of terms that will apply to the referent if the original term applies.

Berkeley accounts for general terms by saying that they are signs which are used to represent more than one particular of a certain kind. This is interpreted to mean that predicate terms are true of all objects similar to the object of which the term is predicated. These terms do not refer.

According to my account, abstract singular terms are also denied a reference to abstract entities. They are systematic signs which derive their meaning from cognate general terms and which are used to exhibit the relationship between our use of the cognate term and other general terms. Unfortunately I have found no satisfactory way of recasting apparent pronominal references to abstract entities into linguistic forms which do not have these references.

My account of the function of personal pronouns obviates the appeal to a substantial, spiritual ego that is not discoverable in experience. These pronouns refer to persons to which both corporeal characteristics and conscious states are attributable. But even without spiritual egos it is possible to account for the role of spirit in the Berkeleyan philosophy by allowing the mental activities, such as willing, perceiving, and imagining, to assume this role. Berkeley may still claim that spirit is the cause and support of the physical world and even claim the world's continued existence, since the concept of an omni-perceiver is not self-contradictory.

The theory given here employs the use of a public proper object of perception. The alternative idealistic account employs a "receptacle" model of mind which is inconsistent with the Berkeleyan denial of abstract entities.

Microfilm \$2.85; Xerox \$9.90. 217 pages.

AXEL HÄGERSTRÖM'S PHILOSOPHY OF RELIGION, WITH SPECIAL REFERENCE TO HIS THEORY OF KNOWLEDGE AND HIS CONCEPT OF REALITY.

(L. C. Card No. Mic 60-945)

Robert Theodore Sandin, Ph.D.
University of Minnesota, 1959

Axel Hägerström (1868 - 1939) took as the motto for his own summary of his philosophy (*Selbstdarstellung*) the saying, *Praeterea censeo metaphysicam esse delendam*. With a remarkable scholarship, Hägerström sought to root out metaphysics from a variety of disciplines -- from ontology, from ethics, from law, from religion, even from physical science. From Uppsala University, where he was professor of practical philosophy, Hägerström exerted an almost determinative influence upon contemporary Swedish philosophy, which has come to be especially characterized by an anti-metaphysical disposition.

This study is an examination of Hägerström's critique of metaphysics in its religious form. Hägerström contends that religious assertions, regarded as descriptions of something real, are self-contradictory and absurd. He derives this view of the nature of religious propositions from an analysis of the concept of reality. To say that something is real, he holds, is to say that it is self-identical and determinate. Reality means determinateness. Metaphysical religiosity, however, asserts the reality of God as the Absolute, the Indeterminate, the Possessor of

all properties. Metaphysical religiosity, therefore, involves the self-contradictory assertion that something indeterminate (God, the Absolute) is determinate (real). Furthermore, Hägerström continues, it is only as being in space and time that anything can be construed as determinate. Therefore in order to be real, a thing must be a determinate term in the spatio-temporal continuum. It follows that it is self-contradictory and absurd to talk about an eternal Spirit as something real.

The Hägerströmian concept of reality is in turn derived from an analysis of knowledge as a state of consciousness. Hägerström rejects epistemological subjectivism, the epistemological doctrine that in knowledge the knowing subject is aware only of its own states. In place of this doctrine he advances the "thesis of reality," according to which in every cognition the self-identity and determinateness of the object of knowledge, over against the knowing subject, is presupposed. An object of knowledge must be self-identical and determinate. But what is true of objects of knowledge is true of the real as such. What is real, then, must be self-identical and determinate.

The examination of Hägerström's argument leads to the conclusion that, as an ontological doctrine, Hägerström's concept of reality has no more than a dogmatic basis. As an epistemological doctrine, on the other hand, it has no implications for ontology. Hence Hägerström does not succeed in establishing the impossibility of the existence of God (in the ontological sense), but at best shows only the impossibility of knowledge in the field of religion (and in the *Geisteswissenschaften* generally).

Hägerström supplements his philosophical analysis of the nature of religious propositions with a psychological account of the origin of religious beliefs. Religious propositions, which are supposed to characterize a reality whose determinateness cannot be specified, are really only expressions of feeling. Religious beliefs have their source in certain identifiable feelings and in the tendency of the mind to confuse a state of feeling with a state of knowing. A parallel account is given of the nature and sources of ethical beliefs. Ethical propositions also are not descriptions of anything real, but are only expressions of feeling. The relation between religion and morality is discussed in terms of the role played by religious feelings and ideas in the development of ethical feelings and ideas.

The study makes considerable reference to the developments in Swedish philosophy which form the background for Hägerström's work. Special attention is given to Boströmian metaphysics. An attempt is made to clarify the distinctive features of Hägerströmianism by comparing and contrasting it with German and British positivism.

Microfilm \$4.50; Xerox \$16.00. 351 pages.

THE ROLE OF THE "OVERLAP" IN COLLINGWOOD'S PHILOSOPHY.

(L. C. Card No. Mic 60-1046)

Sherman Miller Stanage, Ph.D.
The University of Colorado, 1959

Supervisor: Professor David Hawkins

This investigation attempts to answer two questions: What are the distinctive characteristics, the special ar-

rangements, and the interrelations which Robin G. Collingwood maintains that overlapping philosophical concepts must have such that a given group of them may be expounded as a scale of forms? What special function(s) does this overlap serve in selected portions of his philosophy?

In Part One I have attempted to answer the first question by showing that the structure of the overlap is: (1) A serial arrangement of concepts (2) which overlap, i.e., which are successive modifications of previous concepts, where "previous" means "logically prior to" and "logically less inclusive than." (3) The fundamental relation between any two adjacent overlapping concepts is that one is "higher" than the other on a scale of forms (4) such that the "higher" concept must be comprehended through reference to the "lower" concepts on the scale, and (5) as a culmination of all previous concepts on the scale. (6) This serial arrangement of overlapping concepts on a scale of forms is a purely logical relation (7) which seems to be used by Collingwood as a presupposition of philosophical method. In Part Two I have offered an answer to the second question by showing that in some of Collingwood's writings the overlap functions as a presupposition of philosophical method. Following the formulation of six conditions which a presupposition must meet in order to be termed a "relative presupposition" according to Collingwood, I concluded that the overlap could be termed a "relative presupposition" of philosophical method as it functions in some of his writings, but that it could not be termed an "absolute presupposition" of philosophical method in these writings because it does not meet the seven necessary conditions for terming a presupposition an "absolute presupposition" in Collingwood's sense. Following these conclusions I suggested ways in which the overlap might be related to the notion of "absolute presuppositions". First, I attempted to clarify the possible use of the overlap as an "absolute presupposition" in Collingwood's philosophical study of the concept Nature. Secondly, I tried to clarify the possible use of the overlap in the study of the modifications which take place when "absolute presuppositions" change. Microfilm \$3.25; Xerox \$11.25. 249 pages.

THE PHENOMENOLOGICAL APPEAL TO MORAL EXPERIENCE: A STUDY OF MANDELBAUM'S MORAL PHILOSOPHY.

(L. C. Card No. Mic 60-876)

John Grantham Utzinger, Ph.D.
University of Washington, 1959

Chairman: A. I. Melden

Maurice Mandelbaum is a contemporary moral philosopher who believes that much of recent moral philosophy involves question begging procedures. This essay is a critical examination of Mandelbaum's position as contained in his recent book *The Phenomenology of Moral Experience*.

An examination of Mandelbaum's position is important because it represents an alternative to the method of doing moral philosophy which has gained recent popularity in

England and the United States--the method which has been called "linguistic" or "analytic." Mandelbaum is convinced that any attempt to approach the questions raised by the existence of moral controversies by an analysis of the content of moral assertions actually made by men necessarily begs the question of which of these assertions are true and which are false. Mandelbaum's own approach is non-contentual--it seeks to describe the way the total situation appears to the person making the moral judgment and it treats the judgmental act as an actual concrete experience rather than as a combination of abstract logical and psychological features.

Through the application of this particular method Mandelbaum hopes to arrive at a clarification of the common, generic features of all moral judgments. Once these features have been found they will provide a means for distinguishing spurious from genuine moral judgments and valid from invalid ones, and they will do this without begging any question of moral truth.

This is an ambitious program, but a careful examination of his actual procedure shows that it fails. We will show that the appearance of Mandelbaum's success depends upon two fundamental mistakes which permeate his account: (1) The mistaken belief that the notion of validity can be understood apart from the notion of truth; (2) the identification, in many places, of a belief or a judgment with a mental event or state.

In the course of the discussion of these two points many fundamental questions in ethical theory are touched upon. The conclusion that is reached is that moral philosophy cannot be carried on in a moral vacuum, and that a moral philosopher cannot be morally neutral. However, it is shown that these are not good grounds for the charge that moral philosophy is essentially a "question-begging" procedure. Microfilm \$3.15; Xerox \$11.05. 242 pages.

THE PROBLEM OF MAN AND HIS JUSTIFICATION IN THE PHILOSOPHY OF FRIEDRICH NIETZSCHE

(L. C. Card No. Mic. 59-6992)

Martha Elaine Williams, Ph.D.
Bryn Mawr College, 1959

This dissertation presents the philosophy of Friedrich Nietzsche considering the problem of the justification of man as the leitmotif of his thought.

The Introduction serves as an orientation to Nietzsche's position in the history of Western thought. Some fundamental problems concerning the interpretation of Nietzsche are discussed. It is proposed that Nietzsche is a consistent thinker although he does not belong to a school of philosophy and does not present his philosophy within the structure of a formal system.

The first part of Chapter I elaborates the theme that Nietzsche is a consistent thinker. His conception of the "will to truth" and his method of philosophical investigation are discussed. Nietzsche's criticism of the divorce of Being and becoming made by Plato and Christian theologians is discussed and his own metaphysics of the continuum of becoming is presented. It is shown in what manner the metaphysical inquiry is related to the problem of human justification. The fundamental principles of human valuation are discussed and two types are distinguished. Like other existents, man stabilizes his type by means of reactive valuation. Man, however, realizes his full potentialities only through recreative valuation by which he transmutes existence after his own image in human freedom.

Chapter II is a systematic examination of the nature and purpose of human values in morality, science, and art. Nietzsche's conception and criticism of the Christian weltanschauung are presented and contrasted with his Dionysian "pessimism of strength." His concept of the transvaluation of reactive into recreative values in the three domains is discussed. It is also shown in what respects morality, art and science are inadequate in themselves to justify mankind, but how, when synthesised by the creative man, each contributes to the Dionysian culture in which human existence is redeemed.

Chapter III presents Nietzsche's ideal of a Dionysian age in which human life assumes the dignity of a tragedy. Nietzsche's critique of the modern age is given and it is shown how the "good Europeans," the heirs of Europe's cultural traditions, may create the new culture from the open society of Nietzsche's age. The artist-ruler of the tragic culture, the Superman, is considered with reference to the continuum of the Dionysian culture in which life is justified as an esthetic phenomenon.

In the Conclusion Nietzsche's thoughts concerning the task of the philosopher are examined. The problem of the realization of the Dionysian culture is discussed. The dissertation concludes with a summary of Nietzsche's thoughts concerning human destiny.

Microfilm \$3.45; Xerox \$12.15. 266 pages.

PHYSICS

PHYSICS, GENERAL

A STUDY OF THE POLARIZED COMPONENT OF THE SOLAR CORONA

(L. C. Card No. Mic 60-1056)

James Clinton Axtell, Ph.D.
University of Colorado, 1959

Supervisor: Professor William A. Rense

A new instrument has been designed to observe the polarized component of the light from the solar corona. Taking advantage of the principles of the Lyot coronagraph, and the fact that the scattered light from the corona is highly polarized, the new instrument enables the observer to detect the K-corona to a distance in excess of one solar radius from the limb of the sun.

The theory of scattering by free electrons shows that the coronal light, integrated along the line of sight, should be partially plane polarized with the plane of vibration parallel to the tangent to the solar limb. By appropriate adjustment, the instrument detects only that component of the polarized light having the above property. It has been shown that the n^{th} order multiple scattering in the earth's atmosphere can produce a significant polarization of the sky-light, the direction of which lies in a plane parallel to the vertical circle passing through the sun. Other scattering effects, e.g. Rayleigh scattering by the atmosphere, have been found to be essentially negligible under good observing conditions. A method has been evolved to correct the observations for sky effects.

Examination of the records secured on 2 May, 3 June, 4 June, and 5 June, 1957, shows that some correlation exists between the brightness of the K-corona and the intensities of the red and green coronal emission lines. However, the number of converse cases, where brightening was observed in either the K-corona or the E-corona, unaccompanied by an associated brightening in the other, was sufficient to suggest the correlation was not large. The argument that the red line is sensitive to the electron density was not confirmed by this research. No yellow line was observed during the period of this study.

In order to determine the electron density in various regions of the corona, it was necessary to adopt some model which was amenable to calculation. By regarding the corona as consisting of a spherically symmetric background containing regions of enhanced or reduced brightness showing cylindrical symmetry, it was possible to construct a corona having the desired shape. It is found that the radiance gradients in regions of enhanced brightness are essentially the same as those in the background, when at considerable distance from the limb. As the limb is approached the gradient then exceeds that in the background. In regions of lower brightness than the background, the gradients are greater near the limb, gradually

decreasing with radial distance, until, at one radius, they are lower than the background. Regions of enhanced brightness seem to remain so far out into the corona, while regions of depressed brightness fade into the background.

The brighter regions of the K-corona show an electron density which is from 1.5 to 2.5 times the average density at the same radius. The electron density in depressed regions is found to be about 1/50th the density in the surrounding average corona. It is probable that the geometry used to describe a depressed region is wrong.

An inflection in the brightness gradient was found on several occasions. This was accounted for by supposing two streamers to have crossed in space. On 5 June, 1957, a small region of the corona showed rapid brightening to a figure far in excess of the values ordinarily observed for bright regions. The small dimensions of the region suggested that some mechanism had operated to inject a cloud of electrons into the corona. No clear-cut source of such electrons could be found.

Microfilm \$2.50; Xerox \$6.60. 140 pages.

PHOTOEMISSION FROM POTASSIUM TELLURIDE

(L. C. Card No. Mic 60-1058)

William Ernest Behring, Ph.D.
University of Colorado, 1959

Supervisor: Professor Emeritus William B. Pietenpol

The purpose of this investigation was to produce K_2Te and measure the photoemission from it and from these results to attempt to deduce information about the solid state energy levels of this substance.

The potassium telluride photosurface was produced by evaporating a film of tellurium onto a quartz plate from a piece of tellurium contained in an electrically heated tungsten spiral. The phototube was heated to about 90° C in a furnace so that potassium vapor which entered the phototube from a heated side tube would react with the tellurium film to form a photosensitive layer of K_2Te .

The photosurface was illuminated with a measured amount of monochromatic light and the resulting photoemission current was measured for several different wavelengths between 2000 and 3000 Å.

The experimental results showed that the photoelectric threshold of the K_2Te photosurface was at approximately 2750 Å and that from this point on the photoemission increased rapidly as the wavelength decreased. The photoelectric yield at 2150 Å was 10^{-3} electrons per quantum and was still increasing rapidly with decreasing wavelength. The relatively high yield obtained at short wavelengths indicated that the photoelectrons came from the

valence band and that they could escape fairly easily into the vacuum. Hence, it was concluded that the K_2Te surface was an intrinsic semiconductor for which the top of the valence band lay 4.5 electron volts below the vacuum energy level and for which the conduction band lay near the vacuum level. Microfilm \$2.50; Xerox \$3.80. 66 pages.

OPTICAL CONSTANTS OF SOME IONIC CRYSTALS IN THE REGION OF THEIR FAR INFRARED EIGENFREQUENCIES

(L. C. Card No. Mic 60-1170)

Raymond Lee Brown, Ph.D.
The Ohio State University, 1959

The far infrared spectrograph at the Ohio State University was used to measure the transmission of six alkali halides in the wavelength region neighboring their eigenfrequencies. The materials studied were lithium fluoride, sodium chloride, sodium bromide, potassium chloride, potassium bromide, and potassium iodide. Since these materials are very strong absorbers of radiation of wavelengths near their eigenwavelengths, the transmission of very thin samples, 0.1 to 1.0μ thick, was measured.

The samples were prepared by evaporating, in a high vacuum, chemically pure material on to collodion substrates about 0.05μ thick. The thicknesses of the deposited films were measured to an accuracy of about 0.01μ . The transmission of three thicknesses of material was measured at two temperatures, $300^\circ K$ and approximately $100^\circ K$. The transmission measurements are believed to be in error by less than ± 2 per cent of full scale (100 per cent transmission).

The transmission of a material is ordinarily a complex function of several parameters: d , the thickness of the sample; n , the refractive index; k , the absorption coefficient; and λ , the wavelength of the radiation. Under the condition fulfilled in the experiment, the thickness of the sample is much less than the wavelength, a fairly simple approximate transmission formula can be developed in terms of the quantities d ; nk ; n^2-k^2 ; and λ .

The wavelength dependence of the quantities nk and n^2-k^2 are assumed to be adequately described by a Lorentzian dispersion formula. The dispersion formula can be written in terms of four constants: the eigenwavelength, the static dielectric constant, a high frequency dielectric constant, and a damping constant.

The approximate transmission formula combined with the dispersion formula makes it possible to calculate the wavelength dependence of the transmission for a given sample in terms of these four constants. The value of the high frequency dielectric constant was taken from a summary given by Born and Huang (*Dynamical Theory of Crystal Lattices*, Clarendon Press, Oxford, 1957). The appropriate values of the three other constants for each material and temperature were determined from the experimental data. The eigenwavelength was determined as the wavelength of minimum transmission of the thinnest sample. Values of the static dielectric constant and damping constant were determined, which gave good agreement between the measured and calculated transmission.

The values of n and k were then calculated by using

the dispersion formula and the four constants determined in the above manner. This was done for a range of wavelengths in the region of strong absorption about the eigenwavelength.

A review of classical dispersion theory and of the theory of transmission of thin films is included. The far infrared spectrograph is described with particular emphasis on the filtering methods used to obtain high spectral purity. A transistorized regulated power supply for the Golay detector and a semi-automatic "point-by-point" recording system which made the transmission measurements more reliable are also described.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

MICROWAVE SPECTROSCOPY IN THE 0.5 TO 1.5 MILLIMETER WAVE REGION: HI, DCl, DBr, DI, AND CO.

(L. C. Card No. Mic 60-262)

Monroe Joseph Cowan, Ph.D.
Duke University, 1959

Supervisor: Walter Gordy

The purpose of the present study was to extend microwave methods further into the submillimeter wave region in order to determine more accurately the molecular constants of some light diatomic molecules previously investigated only by infrared techniques, and also to increase the accuracy and sensitivity of microwave gaseous absorption spectrometers in the already workable shorter

TABLE I. MOLECULAR CONSTANTS OF THE HYDROGEN AND DEUTERIUM HALIDES HI, DCl, DBr, AND DI

	HI ¹²⁷	DCl ³⁵	DCl ³⁷
$\nu_0 (J=0 \rightarrow 1)$ (Mc/sec)	385,293.27 \pm 0.70	323,295.77 \pm 0.13	322,349.69 \pm 0.13
λ in mm	0.778	0.927	0.930
Quad. Coupling $eQq(\text{hal})$ in Mc/sec	-1831.0 \pm 3.0	-67.3 \pm 0.7	-53.0 \pm 0.7
Mag. Coupling $C_I(\text{hal})$ in Mc/sec	0.26 \pm 0.2	0.03 \pm 0.10	0.00 \pm 0.10
B_0 in Mc/sec	192,658.8 \pm 0.5	161,656.10 \pm 0.07	161,183.02 \pm 0.07
B_e in Mc/sec	195,23 ₂	163,34 ₂	162,86 ₂
r_0 in Å	1.6199 ₂	1.2812 ₂	1.2812 ₂
r_e in Å	1.6090 ₁	1.2746 ₁	1.2746 ₁
	DBr ⁷⁹	DBr ⁸¹	DI ¹²⁷
$\nu_0 (J=0 \rightarrow 1)$ (Mc/sec)	254,704.675 \pm 0.05	254,548.914 \pm 0.05	195,067.866 \pm 0.04
λ in mm	1.18	1.18	1.54
Quad. Coupling $eQq(\text{hal})$ in Mc/sec	530.5 \pm 0.3	443.5 \pm 0.3	-1823.3 \pm 0.3
Mag. Coupling $C_I(\text{hal})$ in Mc/sec	0.15 \pm 0.04	0.16 \pm 0.04	0.17 \pm 0.02
B_0 in Mc/sec	127,358.06 \pm 0.10	127,280.14 \pm 0.10	97,537.1 \pm 0.2
B_e in Mc/sec	128,63 ₂	128,55 ₂	98,45 ₂
r_0 in Å	1.4214 ₄	1.4214 ₄	1.6166 ₆
r_e in Å	1.474 ₃₈	1.474 ₃₈	1.6091 ₃

TABLE II. OBSERVED AND CALCULATED
TRANSITION FREQUENCIES AND DERIVED
MOLECULAR CONSTANTS OF $C^{12}O^{16}$

Transition	Frequency (Mc/sec)		Wavelength (mm)
	Calculated	Observed	
$J = 0 \rightarrow 1$	115,271.195	$115,271.195 \pm 0.015$	2.60
$J = 1 \rightarrow 2$	230,537.978	$230,537.974 \pm 0.030$	1.30
$J = 2 \rightarrow 3$	345,795.940	$345,795.900 \pm 0.090$	0.867

Derived Constants

$$B_0 = 57,635.965 \pm 0.008 \text{ Mc/sec}$$

$$D_0 = 0.1838 \pm 0.0005 \text{ Mc/sec}$$

$$B_e = 57,907.13 \pm 0.26 \text{ Mc/sec}$$

$$r_0 = 3.5761, \text{ \AA}$$

$$r_e = 3.5678, \text{ \AA}$$

millimeter wave region. A careful investigation of these molecules is merited both by their possible use as wavelength standards in the infrared region and by the fact that their $J = 0 \rightarrow 1$ transitions are subject to precise experimental and theoretical treatment. Tungsten-silicon point contact rectifiers exposed directly to the microwave radiation in the waveguide were used as harmonic generators of the fundamental microwave power as obtained from K-band (24,000 Mc/sec) and J-band (32,000 Mc/sec) klystrons. Similar units were used as detectors of the high frequency radiation after it had passed through an absorption cell of either 30 cm or 1 meter length with the signal being displayed by either an oscilloscope or a recording milliammeter. With this spectrometer the microwave region was extended from its previous short wavelength limit 0.77 mm to 0.509 mm with the detection of the $J = 71 \rightarrow 72$ transition of $Br^{81}CN$ using the 18th harmonic of a klystron operating at $\sim 32,700$ Mc/sec. The derived molecular constants obtained from measurements of the $J = 0 \rightarrow 1$ transitions of the hydrogen and deuterium halides are given in Table I, the data for CO in Table II. Hydrogen iodide has the smallest moment of inertia of any molecule yet measured by microwave electronics, the $J = 0 \rightarrow 1$ transition occurring at 0.78 mm. The measurements of the first three rotational transitions of carbon monoxide to an accuracy as much as 1.1 parts in 10^7 contributed to a new band spectrum determination of the velocity of light, $c = 299,793.7 \pm 0.7$ km/sec. The constants D_0 , α and γ from infrared data were employed in the calculation of the B and r values given in Table I.

Microfilm \$2.50; Xerox \$4.40. 85 pages.

THE TEMPERATURE DEPENDENCE OF
THE FERROMAGNETIC RESONANCE LINE WIDTH
IN SINGLE CRYSTALS OF IRON AND NICKEL

(L. C. Card No. Mic 58-5319)

Jerry Arnold Cowen, Ph.D.
Michigan State University, 1954

The temperature dependence of the ferromagnetic resonance absorption in single crystals of iron and nickel has been measured from room temperature to the Curie point. The g factor and line width were measured and the line width interpreted in terms of a reciprocal parameter $1/T_2$.

$1/T_2$ remains essentially constant from room temperature to near the Curie point of the nickel (350°C) with a value of approximately $5 \times 10^9 \text{ sec}^{-1}$. Near the Curie point it appears to rise very rapidly but since the calculated value depends on accurate determination of the saturation magnetization which is strongly temperature dependent, the effect may not be real. In iron $1/T_2$ remained constant at approximately $10 \times 10^9 \text{ sec}^{-1}$ up to 750°C . The data was taken using several different orientations of the single crystals and also using polycrystalline samples—each sample gave essentially the same results.

Microfilm \$2.50; Xerox \$4.20. 80 pages.

EXPERIMENTAL FUSION CURVES OF INDIUM
AND TIN TO 105,000 ATMOSPHERES

(L. C. Card No. Mic 60-1232)

James Duane Dudley, Ph.D.
University of Utah, 1960

Chairman: Peter G. Gibbs

The experimental fusion curves of indium and tin have been determined to a pressure of 105,000 atmospheres. The melting point was detected at various pressures by means of a sharp increase in the electrical resistance of the sample, which gave rise to a sudden increase in the sample temperature. The melting temperature of indium was found to rise smoothly from a normal value of 156°C to a value of 417°C at 105,000 atm. The experimental data are fitted very well by the Simon equation $P/a = (T/T_0)^c - 1$, with $a = 15,000$ atm, $c = 4.34$, and $T_0 = 429^\circ\text{K}$. No evidence of polymorphism is observed. A phase transition is found for tin, with a triple-point on the fusion curve at 38,000 atm, 318°C . The melting temperature for the first phase rises smoothly from its normal value of 232°C to the triple-point, and the data is fitted very well by the Simon equation with $a = 7400$ atm, $c = 11.3$, $T_0 = 505^\circ\text{K}$. The melting temperature for the second phase rises smoothly from the triple-point to a value of 500°C at 105,000 atm, and the data is fitted very well by the Simon-type equation $(P - 38,000)/21,800 = (T/591)^{5.25} - 1$. The uncertainty is estimated to be approximately $\pm 5\%$ in the measured melting temperature, $\pm 5\%$ in the pressure calibration, $\pm 20\%$ in the Simon coefficient a , and $\pm 2\%$ in the Simon exponent c .

Microfilm \$2.50; Xerox \$6.00. 122 pages.

THE SOLAR SPECTRUM
FROM 1800 TO 2300 ANGSTROMS

(L. C. Card No. Mic 60-1071)

Howard Conlee McAllister, Ph.D.
University of Colorado, 1959

Supervisor: Professor William A. Rense

Spectrograms of the solar ultraviolet spectrum obtained by means of a rocket-borne spectrograph were studied in the previously uninvestigated region from 1800 to 2300 angstroms. The spectrograph consisted of a concave grating of 39 cm radius and 6000 lines per cm used in a Rowland mounting at an angle of incidence of 49.5° . The spectrograph was flown at 8:30 a.m.,

August 6, 1957, at Holloman Air Base, New Mexico, in an Aerobee-Hi using a biaxial pointing control to maintain the instrument pointed at the sun. The dispersion in the region investigated was approximately 20 Å/mm and the resolution about 0.3 Å. Of some 1500 features present in the spectrogram in the wavelength region studied, wavelengths of 550 were determined and 630 atomic transitions assigned as responsible for their formation.

The spectral irradiance as a function of wavelength, at an altitude of 140 km, was determined by extrapolation from similar data for longer wavelengths combined with the properties of the spectrograph determined by laboratory measurement. The total radiant flux due to solar radiation in this wavelength range obtained by this procedure was 770 ergs/cm²/sec.

Particularly significant results of the study include tentative identification of arsenic in the solar atmosphere on the basis of the presence of a solar feature at the position of the *raie ultime* and the absence of any other line to account for the feature; demonstration that a strong absorption pair at about 1935 Å is due to autoionization of Al I; indication that the marked decrease in the intensity of the solar spectrum beginning at approximately 2090 Å is caused by strong aluminum absorption; and determination of the wavelength of an as yet unidentified emission feature observed by others near 1892 Å as being 1891.8 ± 0.1 Å. A photometric atlas was prepared from which further study of this portion of the solar spectrum can be effected.

Microfilm \$2.50; Xerox \$5.40. 109 pages.

A STUDY OF THE ATMOSPHERIC TWILIGHT EMISSIONS [OI]5577 AND [OI]6300

(L. C. Card No. Mic 60-1042)

Lawrence Rexford Megill, Ph.D.
University of Colorado, 1959

Supervisor: Professor James W. Broxon

The twilight behavior of atmospheric emissions during twilight in many cases yields a better understanding of the mechanisms involved in the excitation of the radiations than do nighttime studies. This results from the fact that the time at which excitation of the emissions by the sunlight ceases (or begins in the morning twilight) can be calculated.

A detailed analysis of the behavior of the two principal atomic oxygen emissions present in the airglow has been carried out for the night of January 6/7, 1958. A recently developed photometer incorporating a birefringent filter made it possible to make measurements earlier in the evening twilight (and later in the morning twilight) than has previously been possible with photometric techniques. An enhancement of the $\lambda 5577$ Å radiation previously unreported in detail has been measured and analyzed. It has been established the variation of intensity of the enhanced $\lambda 5577$ Å radiation is logarithmic with height, decreasing at higher altitudes. The highest height at which there is detectable emission is 175 km. and the lowest altitude at which measurements could be made is 100 km. The scale

height of the emission is 28.5 km. as opposed to a scale height of about 12 km. for atomic oxygen concentration. From this it is concluded that electrons may well play a role in the excitation mechanism.

The $\lambda 6300$ Å emission has been previously studied, but it is believed that the data presented here are the best which are available. A comparison with recent theory has been made. It is demonstrated that the theory agrees well with the data with the exception that the predicted intensity is somewhat lower than the measured intensity. The measured intensity, however, was considerable higher than is usually observed.

Microfilm \$2.50; Xerox \$5.00. 99 pages.

PHOTON ABSORPTION BY VALENCE ELECTRONS IN ALUMINUM, NICKEL, AND COPPER.

(L. C. Card No. Mic 60-880)

Werner Martin Neupert, Ph.D.
Cornell University, 1960

A normal incidence vacuum spectrograph having a dispersion of 5.26 Å/mm. has been modified for the study of the secondary structures in the photon absorption by valence electrons. The instrument covers the region from 200 to 900 Å, this range corresponding to incident photon energies of 50 to 15 eV. The resolution at the high energy end is better than 0.1 eV. An important feature of the design is the feasibility of producing absorbing layers directly within the chamber and keeping them essentially free from contamination during the transmission measurements.

In aluminum, fine structure in the absorption spectrum has been observed on the low energy side of the $L_{2,3}$ edge. Absorption maxima are found at 14.8, 16.0, 17.4, 20.2, 23.0, 27.6 and 31.0 eV for films having an area density (mass of absorber divided by area of absorber) of about four micrograms per cm². The excitation of the L electrons in aluminum requires approximately 72 eV, hence the structures observed represent absorption by valence electrons. Several of the maxima have their counterparts in secondary maxima on the high energy side of the $L_{2,3}$ edge and two others have analogs in the characteristic electron energy loss spectrum. This correspondence suggests that photon absorption may be partially attributable to the indirect excitation of plasma oscillations, through the production of virtual photoelectrons as well as to one-electron interband transitions.

Absorption measurements have been made on nickel films with area densities in the range from 15 to 34 micrograms per cm². Distinct maxima are observed at 17.3, 18.7, 20.4, 22.0, 23.6, 25.4, 27.6 and 46 eV. These maxima are attributed to photon absorption by 3d electrons. There is no consistent correlation with secondary structure associated with the $M_{2,3}$ or $L_{2,3}$ absorption edges. This is not unexpected since absorption in the latter cases arises through transitions of electrons from p states. A correspondence with K edge fine structure suggests that at least two of the maxima may be the result of interband transitions. An attempt has been made to synthesize the observed spectrum assuming that one-electron transitions are made from two separated sets of levels in the filled

valence band to narrow bands of vacant levels. The observed spectrum can be synthesized if the separation of the initial levels is taken to be 1.7 ev. This figure agrees with the theoretically predicted splitting of the 3d band. The anomaly in the widths of the observed maxima and the usual broad electron loss peak at 23 ev suggests that collective oscillations may contribute only a general absorption background in the region from 20 to 25 ev.

For copper, absorption maxima are observed at 17.1, 20.0, 21.8, 23.3, 25.8, and 35.0 ev. An approximate correspondence can again be made with K edge fine structure data for several maxima. In this case a correction must be made for the fact that the maxima in the 3d electron distribution occur about 2.5 ev below the Fermi level whereas K edge fine structure is measured relative to the absorption edge. There is no correlation with $M_{2,3}$ or $L_{2,3}$ absorption structure.

This work has led to the conclusion that collective oscillations (plasmons) as well as interband transitions may be responsible for the attenuation of the photon beam. In the electron loss experiments the electron-electron interaction leading to plasmon excitation may be so great that absorption arising from interband transitions may be obscured. In the present experiment plasma excitation is at most a second order process. Hence, interband transitions may be the predominant mode for attenuation of the photon beam. Microfilm \$2.50; Xerox \$5.40. 107 pages.

INTERFEROMETRIC MEASUREMENTS OF ISOTOPE SHIFTS IN MERCURY II AND MERCURY III WITH ENRICHED ISOTOPES

(L. C. Card No. Mic 60-1231)

Richard Warren Shorthill, Ph.D.
University of Utah, 1960

Chairman: Dr. G. R. Fowles

Interferometric measurements of isotope shifts $\Delta\sigma$ have been made in Hg I $\lambda\lambda$ 6123, 5461, 4916, 4358, and 4046, in Hg II $\lambda\lambda$ 6521, 6150, 6100, 6090, 5889, 5872, 5699, 5677, 5595, 5425, 5205, 5196, 5162, 5146, 5128, 4962, 4660, and 3984, and in Hg III $\lambda\lambda$ 6584, 6501, 6418, 6220, 5210, 4973, 4869, 4797, 4470, 4216, and 4122 (for those wave lengths underlined $\Delta\sigma$ has been measured for the first time).

The sources contained enriched isotopes of Hg^{198} , Hg^{200} and Hg^{202} used in the electrodeless discharge arrangement. The oscillator was of the self-pulsing design operating at a frequency of 15 Mc.

In particular those lines having large isotope shifts were studied. The results indicate that the ratio $R_\sigma = \Delta\sigma / (\sigma_{198} - \sigma_{200})$ (200 - 202) is constant within experimental limits, namely $R_\sigma = 0.912 \pm 0.010$. The decrease in isotope shift for lower levels in the $5d^8 6s^2$ configuration of Hg III first found by E. W. Foster at Imperial College, London has been established as real.

Microfilm \$2.50; Xerox \$3.00. 60 pages.

MULTILAYER INTERFERENCE FILTERS FOR THE INFRA-RED

(L. C. Card No. Mic 60-1076)

Vern Newton Smiley, Ph.D.
University of Colorado, 1959

Supervisor: Professor William A. Rense

The basic theory of interference filters is discussed starting with the simple Fabry-Perot filter. Methods of calculating the transmittance and reflectance of a multilayer stack are discussed with emphasis on an analog computer method. A derivation of a nearly exact expression of the bandwidth and an expression for the fraction of power transmitted between half-maximum points for an all-dielectric Fabry-Perot filter are given. Band-pass filters of a type containing more than one multiple half-wave layer are examined in detail by calculated curves for several different configurations; they are shown to be superior to the Fabry-Perot dielectric filters.

A five-layer dielectric Fabry-Perot filter designed for use as a low-pass filter is treated in detail. A method of analysis consisting of replacing any multilayer system by one layer with two effective interfaces is used to explain the operation of band-pass and low-pass filters.

Methods of making experimental filters are discussed, including the experimental difficulties involved. An example of a five layer experimental filter is given.

Microfilm \$2.50; Xerox \$7.80. 168 pages.

SOLAR EMISSION LINES IN THE EXTREME ULTRAVIOLET

(L. C. Card No. Mic 60-1079)

Theodore Dean Violet, Ph.D.
University of Colorado, 1959

Supervisor: Professor William A. Rense

The solar ultraviolet spectrum has been the subject of extensive investigation since rockets became available for research purposes in 1946. However, the wavelength region below 1000 Angstroms had remained almost entirely unexplored by instruments capable of relatively high resolving power until this work was begun. The reason for the lack of information regarding this spectral range was that the spectral line intensities were too weak to be detected by conventional spectrographs in the short exposure times dictated by the rockets' time in flight.

Interest in the extreme ultraviolet region of the solar spectrum is great because this region may be the source of much information concerning the solar atmosphere and because its high energy photons have a profound influence on the terrestrial atmosphere. The purpose of this work was to investigate, in a general way, the characteristics of the spectral range from 75 to 1216 Angstroms.

A grazing-incidence spectrograph was modified by placing a toroidal mirror in front of the slit so that astigmatism was greatly reduced over a wide range of wavelengths and the aperture of the grating was increased. A substantial increase in the speed of the spectrograph

resulted from this modification, and this increase made it possible to detect the relatively faint solar radiations in the extreme ultraviolet.

Two spectrographs were flown in Aerobee-Hi atmosphere sounding rockets to altitudes above 200 kilometers, higher than such instruments had been flown before.

Analysis of the spectrographic data obtained on these flights yielded the wavelengths of approximately 150 solar emission lines. Tentative identification of the emitters of about sixty of these lines has been made. The shortest wavelength observed was 83.9 Angstroms. The most conspicuous feature of this region of the solar spectrum was the resonance line of He II at 303.8 Angstroms. This line was found to have no appreciable width, and its intensity was estimated by comparison with the Lyman-alpha line on the same spectrograms. The intensity of He II relative to that of Lyman-alpha was 0.27 at 212 kilometers and 0.014 at 140 kilometers on one flight and 0.14 at 195 kilometers and 0.07 at 175 kilometers on the other. It seems probable that the intensity of this line would exceed that of Lyman-alpha outside the earth's atmosphere. The resonance line of neutral helium is very weak by comparison.

It has been shown that the energy flux of the 303.8 Angstrom line is sufficient to account for the ionization of atomic oxygen in the atmosphere and thereby to form the ionospheric F 1 layer.

Microfilm \$2.50; Xerox \$4.60. 86 pages.

PHYSICS, ELECTRONICS AND ELECTRICITY

DEMBER EFFECT AND TRAP LEVELS IN SILVER CHLORIDE

(L. C. Card No. Mic 60-892)

Alvin Malcolm Goodman, Ph.D.
Princeton University, 1958

Dember effect has been investigated in silver chloride using a chopped light-A.C. amplification system of measurement. The effect has been resolved into a "self-sustaining" component which reaches a steady state (for a particular wavelength and intensity of incident light) and a "non-self-sustaining" component which decays with time. The "non-self-sustaining" effect occurs only after prior illumination by intrinsically absorbed light. The steady state "self-sustaining" Dember effect has been found to be of only one polarity (normal polarity) when the illuminated face of the sample is coated with silver but both polarities are present when the illuminated face is not coated. The normal or positive effect shows up at a shorter wavelength and the inverse effect at a longer wavelength. A possible explanation for this behavior is suggested. In the coated sample, the normal polarity effect was found to exhibit a peak at a wavelength of about $0.383\text{--}4\ \mu$ at $T = 88^\circ\text{K}$. A theoretical expression for the amplitude of the normal polarity effect as a function of absorption coefficient is developed based on a simplified model. The disagreement between the predicted and observed behavior is discussed.

A previously unreported trap level has been found with

an optical activation of about $0.407\ \mu$. A very broad response indicating one or more trap levels has been found with an optical activation threshold wavelength of about $2\ \mu$. It was not found possible to locate traps with optical activation wavelengths greater than $2\ \mu$, but suggestions are made for overcoming the difficulties encountered in the present work.

Thermal conductivity glow measurements have been used to detect traps with thermal activation energies in the range 0.2 to 0.5 eV, and suggestions are made for extending these measurements to locate traps with lower activation energies. Microfilm \$2.50; Xerox \$5.20. 101 pages.

MULTIPOLE FIELD EXPANSIONS AND THEIR USE IN APPROXIMATE SOLUTIONS OF ELECTROMAGNETIC SCATTERING PROBLEMS

(L. C. Card No. Mic 60-1189)

Edward Morton Kennaugh, Ph.D.
The Ohio State University, 1959

The representation of electromagnetic fields by multipole expansions and the use of such expansions in the approximate solution of scattering problems are discussed. The problem of representing solutions of Maxwell's equations in homogeneous isotropic regions is considered in Chapter I. Several methods for obtaining multipole expansions from either a knowledge of the source distribution or the values of the tangential fields over a closed surface, or the field components and all their derivatives at a single point, are described. The application of multipole fields in the approximate solution of single-body scattering problems is discussed in Chapter II. A method which obtains the best approximation to a match of tangential field components at the scatterer surface is described. The case of a perfectly conducting scatterer is considered, and it is shown that the convergence of field-matching techniques can be verified and a bound on the mean square error in the scattered field be obtained if a certain inequality can be derived. Such an inequality is derived for a spherical scattering surface.

The application of approximate field matching techniques is illustrated for the perfectly conducting prolate and oblate spheroid in Chapter III. First and second order solutions are obtained for a prolate spheroid with 0.35 and 0.28λ axes and for an oblate spheroid of 0.42 and 0.35λ axes illuminated by a plane electromagnetic wave incident along the symmetry axis. The calculated scattering cross sections at angles of 30° , 60° , 90° and 120° from the axis are compared with experimentally determined values, and it is concluded that the approximation is accurate to within 1 decibel for these scatterers.

Microfilm \$2.50; Xerox \$4.40. 81 pages.

AMBIENT HISTORY DEPENDENCE IN THE ELECTRICAL RESISTANCE OF CORUNDUM

(L. C. Card No. Mic 60-1229)

Ross Norman Tucker, Ph.D.
University of Utah, 1960

Chairman: Dr. Peter Gibbs

The conduction current of single-crystal α - Al_2O_3 was measured over the temperature range 200°C to 900°C . It was observed that the conduction current was strongly dependent upon both the environmental history and the dislocation structure of the sample. Boiling the samples for one hour in various aqueous solutions [6-N HCl , $\text{Mg}(\text{NO}_3)_2$, and NaCl] lead to significant increases in the conduction current as compared to samples which had been "cleaned" by heating at 1000°C in nitrogen. In each of the controlled contamination cases, the conduction current passed through a maximum: for HCl -contamination, the maximum occurred at about 350°C ; for $\text{Mg}(\text{NO}_3)_2$ -contamination, at about 570°C ; and for NaCl -contamination, at about 705°C . The maxima were sharply followed by pulses in the conduction current, the frequency of which were observed to be sensitive to external mechanical vibrations. The pulses and maxima were absent upon cooling from 1000°C or reheating the cleaned crystal in a dry nitrogen atmosphere. Conduction current measurements were made on deformed samples, both parallel and transverse to the bend-induced dislocation structure. The parallel, contaminated conduction current showed a more than ten-fold increase over the other cases. From these results, it is speculated that impurity ions from the ambient can penetrate the crystal along dislocation lines at low temperatures, leading to a dislocation "short-circuiting" of the bulk crystal. These ions are expelled from the dislocation network by heating to higher temperatures, giving rise to the observed pulses. A model is proposed for the penetration of the contaminating ions, and for the dislocation "short-circuiting" of the crystal. Microfilm \$2.50; Xerox \$3.00. 39 pages.

PHYSICS, METEOROLOGY

THE ATMOSPHERIC DIFFUSION OF RADIOACTIVE MATERIAL RELEASED FROM THE STACKS AT THE NATIONAL REACTOR TESTING STATION

(L. C. Card No. Mic 60-1002)

Norman Frederick Isltzer, Ph.D.
University of Wisconsin, 1960

Supervisor: Professor V. E. Suomi

Some of the reactor operations and special tests at the National Reactor Testing Station, Idaho, result in the release of detectable amounts of radioactive material. The releases are usually from 150- or 250-foot stacks. Ground-level gamma dose from the radioactive cloud was measured by a "sky scanner", a sodium iodide crystal

scintillometer mounted in the bottom of a lead barrel. This restricted the radiation striking the crystal to a small conical part of the cloud. The methods of interpretation of the data to construct the lateral variance of the cloud are given along with the results of several tests. Fallout data were also used for studies of the variance of the diffusing material. The measurements were carried out to three miles from the stack.

Some data of gamma activity obtained by sampling with an airplane are also presented. This has furnished estimates of vertical cloud widths and cloud rise for hot plumes. Some vertical cloud widths from measurements of smoke plumes are also presented.

A comparison was made of the lateral variance of the diffusing material with the variance of the wind direction fluctuations. The relationship between the range and the variance of the wind direction was explored. Studies of the behavior of the range with stability and wind speed are also presented. From the comparison of Sutton's diffusion to ten percent of the peak activity in the cloud center, compares favorably to a computed mean of 2.8 degrees. The mean measured angular horizontal width, although these data must be considered to be quite approximate, was 26 degrees. The measurements, conducted during periods of stable temperature stratification and light winds, illustrate the predominance of horizontal over vertical diffusion for such meteorological conditions.

The measured plume heights were considerably higher than those computed by standard means. The effluent sampled was released from a 150-foot stack at temperatures of 500°F . During one series of measurements the cloud axis rose to 900 feet at a distance of four miles from the stack, and activity above background was recorded 1500 feet above the ground at this distance. The computed effective stack height was only 270 feet.

Additional information concerning vertical diffusion was obtained by observing the visible edge of smoke plumes out to 4,000 feet through theodolites. A mean value of 0.193 for Sutton's vertical diffusion coefficient, C_z , was obtained for near-neutral temperature lapse rates.

Comparisons of the lateral variances of the diffusing material with the variances of the wind direction fluctuations showed good agreement. This indicates the usefulness of wind direction variance as a fundamental parameter of turbulence and diffusion.

The relationship between the range and the variance of the wind direction was explored and good correlation between the two was found. The wind direction was also found to be well correlated to the wind speed and to the temperature lapse rate; with increasing wind speed and increasing stability, the direction range decreased. These relationships enable rapid computations of wind direction variance for diffusion forecasts and for calculations of air concentration and radioactive dose-rate. Considerable time and labor are also saved for constructing diffusion climatologies. Microfilm \$2.50; Xerox \$4.40. 85 pages.

PHYSICS, NUCLEAR

THE ATOMIC MASSES AND THE BINDING ENERGIES
IN THE HEAVY MASS REGION

(L. C. Card No. Mic 60-962)

V. B. Bhanot, Ph.D.
University of Minnesota, 1959

A double-focusing mass spectrometer of six-inch radius was employed to determine twenty-five hydrocarbon types of doublets and seventy isotopic doublets in the region of gadolinium to lead. An isotopic doublet is composed of two isotopes of a particular element. Thirty-two of the seventy isotopic doublets have been published previously.¹

The instrument, the method of measurement and the experimental procedure have been described previously.^{2,3} A brief description has been included in the present report also.

By employing the present isotopic and "hydrocarbon" doublets, an atomic mass for almost all stable isotopes of elements from gadolinium to gold can be determined to a precision of about one part per million in mass. By combining these experimental masses with nuclear data as well as other Minnesota mass spectroscopic data, a mass table for more than 200 nuclides of elements from samarium to radon was prepared. The five heavier "stable" isotopes of Ra²²⁶, Th²³², U²³⁴, U²³⁵ and U²³⁸ were also included. Some adjustments were incorporated in the mass table in order to eliminate or minimize inconsistencies in the experimental data. These adjustments are based, in general, on a comparison of the mass spectroscopic data with the corresponding nuclear data.

The Q values for several nuclear reactions can be calculated by use of the mass data. The calculated Q values have been employed to confirm previous isotopic assignments for some experimental Q values or to make new assignments at places where a previous assignment is considered doubtful or is not available.

The mass data has been employed to calculate wherever possible alpha decay energies in the region of gadolinium to lead. The graph of alpha decay energies against the mass number shows two major discontinuities, which can be definitely attributed to the neutron shell closures at N = 82 and N = 126. Further, a discontinuity at N = 88 is quite apparent, in addition to some other "anomalous" behavior.

The total atomic binding energy has been calculated for each nuclide included in the mass table. These values are employed for the calculation of the average binding energy per nucleon for the "stable" isotopes. These are plotted against the mass number A and show a very marked discontinuity in the region of the double shell closure at Z = 82 and N = 126.

The binding energies of the "last" neutron and of the "last two" neutrons as well as the pairing energy for the "last pair" of neutrons have been calculated, wherever possible, for the nuclides in this heavy mass region. The binding energies for the "last" proton as well as the proton pairing energies have also been calculated. These nucleon binding energies and pairing energies have been plotted against the neutron number N. These plots show major discontinuities at the shell closures for Z = 82, N = 82 and N = 126. In addition, discontinuities in the

regions around 90 neutrons seem to be quite well established, particularly for the case of the neutron pairing energies and the proton pairing energies. The nature of the discontinuities in these two regions does not seem to follow the patterns found at major shell closures. These discontinuities appear, rather, to be caused by a change in the nuclear structure in these regions. Such a change is indicated by other nuclear properties also. Other anomalies of a smaller magnitude are also possibly present.

References

1. W. H. Johnson, Jr. and V. B. Bhanot, Phys. Rev. **107**, 1669 (1957).
2. W. H. Johnson, Jr. and A. O. Nier, Phys. Rev. **105**, 1014 (1957).
3. W. H. Johnson, Jr., Ph.D. Thesis, University of Minnesota (1956).

Microfilm \$2.50; Xerox \$6.60. 140 pages.

A COINCIDENCE STUDY OF PROTON EMISSION
IN ALPHA PARTICLE BOMBARDMENT
OF NICKEL AND IRON

(L. C. Card No. Mic 60-853)

Robert Kleiv Cole, Ph.D.
University of Washington, 1959

A coincidence method was used to study the (α , 2p) reaction for nickel and iron. The angular distributions and proton energy spectra were obtained with bombarding energies of 32, 35, and 42 Mev.

The resulting cross sections and proton distributions indicated that the reaction was primarily compound nuclear in nature. No prominent correlations were observed between the emitted protons. The angular distribution for Ni⁵⁸ was symmetrical about the plane perpendicular to the incident beam and sharply peaked forward and backward along the beam direction. This type of angular distribution could be qualitatively explained by a simple classical model which included the effects of a spinning compound nucleus. However, the large size of this forward and backward anisotropy indicates the need of a more detailed investigation of the emission of protons by an excited nucleus.

Microfilm \$2.50; Xerox \$7.80. 167 pages.

THE PHOTOPRODUCTION OF SINGLE
NEUTRAL PIONS FROM HYDROGEN
IN THE RANGE 900 Mev TO 1200 Mev

(L. C. Card No. Mic 60-888)

Harold Edward Jackson, Jr., Ph.D.
Cornell University, 1960

The reaction $\gamma + p \rightarrow p + \pi^0$ has been studied in the energy range 900 Mev to 1200 Mev. Data have been taken at center-of-mass angles of 47°, 90°, and 125°, and for photon energy intervals of 100 Mev, centered at approximately 950, 1050, and 1140 Mev. The reaction was analyzed

by determining the incident photon energy and the angle of the recoil proton. The recoil proton was counted in coincidence with one of the decay photons from the neutral pion. The probability of detecting one of the decay photons was computed on an electronic computer. A bremsstrahlung beam subtraction technique was used to limit the incident photon energies to 100 Mev intervals. In an auxiliary experiment, the subtraction technique was checked directly by measuring the beam spectrum with the lead glass photon counter. The shape of the resulting difference spectrum was in excellent agreement with that calculated from a thin target spectrum and a 15 percent resolution function for the photon counter.

A measurement was also attempted at a center-of-mass angle of 152° by observing the single photon spectrum resulting from incident photons in the 100 Mev interval centered at 950 Mev as determined by the bremsstrahlung beam subtraction technique. The differential cross section was estimated from the slope of the upper end of the decay photon spectrum. However, because of bad statistics and of uncertainties in the counter resolution, the estimate was not sufficiently accurate and the method was abandoned.

The results of a previous experiment at Cornell include points at 950 Mev. The data of this experiment are in good agreement with these results. The measurements at the forward and backward angles show an increase in the differential cross section at 1050 Mev while the 90° value slowly decreases with energy. The total cross section was estimated by fitting parabolas in the cosine of the center-of-mass angle to the experimental results. There is evidence for a weak maximum of 29.5 ± 2.5 microbarns at 1050. A large positive coefficient of the cosine squared term in the parabolic fits is consistent with a $(1/2, 5/2)$ resonance at this energy.

The relationship between pion nucleon total cross sections and photoproduction cross sections is also discussed. The maximum observed in this experiment is the counterpart of a sharp peak in the π - p scattering cross section observed at a total laboratory pion energy of 1020 Mev. It is not surprising that the photoproduction is so weak since many channels of decay are available to the excited isobar.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

FINAL STATE INTERACTION APPROACH TO THE HIGH ENERGY PEAKS IN THE TOTAL CROSS-SECTION OF PION-NUCLEON SCATTERING

(L. C. Card No. Mic 60-846)

Wen-Nong Wong, Ph.D.
Indiana University, 1959

To investigate whether the spectrum of high energy peaks observed in the total cross-section of π - p -scattering experiments has any characteristic behaviour of a 2-pion-plus-nucleon system, Chew-Low-Wick's static nucleon theory is generalized for the derivation of a 2-meson equation, which in terms of the well-known notations, looks like:

$$\begin{aligned} \langle pq-|V_k|\ell+\rangle &= \delta_{p\ell} \langle q-|V_k|0\rangle + \delta_{q\ell} \langle p-|V_k|0\rangle \\ &- \sum_n \frac{\langle pq-|V_k|n+\rangle \langle n+|V_\ell|0\rangle}{E_n - \omega_\ell + i\gamma} \\ &+ \sum_n \frac{\langle pq-|V_\ell|n+\rangle \langle n+|V_h|0\rangle}{E_f - \omega_\ell - E_n + i\gamma} \end{aligned}$$

To approximate this equation, a model is conceived, in which, via the lowest order dynamical process of very high energy, a couple of intermediate pions and a recoiling nucleon in the s -state are produced. These two pions as seen by the nucleon are each in the p -state. They then interact alternately with the nucleon regarded as static through the 1-meson scattering amplitudes, of which the 33 resonance state is particularly emphasized. Assumptions implicit in such a model amount to treating $n=1$ term in the above equation as special while other terms may be lumped together and regarded as smooth and insignificant, at least within the energy region of our interest. Consequently $\langle pq-|$ may be approximately factored out. By defining the following:

$$\begin{aligned} V_k|\ell+\rangle &= T_E|k\ell\rangle \\ \langle m+|V_h|0\rangle &= \tilde{T}_k^+(m) \quad \begin{matrix} \text{(known if Chew-Low's} \\ T_h(m) \text{ is known)} \end{matrix} \end{aligned}$$

$$\begin{aligned} \text{The totality of} \\ \text{all terms with } n \neq 1 &= B_E|k\ell\rangle \end{aligned}$$

we arrive at an equation in operator form suggesting the kind of final state interaction in the sense of this paper:

$$\begin{aligned} T_E|k\ell\rangle &= B_E|k\ell\rangle + \sum_m \frac{T_G|\ell m\rangle \tilde{T}_k^+(m)}{E - (\omega_\ell + \omega_m) + i\gamma} \\ &- \sum_m \frac{T_E|k m\rangle \tilde{T}_\ell^+(m)}{\omega_m - \omega_\ell - i\gamma} \end{aligned}$$

Diagonalization of this equation is accomplished by making use of a special coupling scheme of the two p -wave pions k & ℓ . If the angular momentum-isospin dependence in $T_E|k\ell\rangle$ is $\phi_{JT}^{MT_3}(k\ell)$ (in which k is coupled to the nucleon first to form a 1-meson isobar $j, t = \frac{3}{2}, \frac{3}{2}$, then ℓ is coupled in to make up J & T) then the same in $T_E|\ell k\rangle$ will be $\phi_{JT}^{MT_3}(\ell k)$. These two isobaric functions are related to each other as:

$$\sum_k \phi_{JT}^{M'T'_3}(k\ell) \phi_{JT}^{MT_3}(\ell k) = \lambda_{JT} \delta_{MM'} \delta_{T_3T'_3}$$

where the isobaric recoupling coefficient λ_{JT} is given by:

$$\lambda_{JT} = (-1)^{J+T+1} 16 W(1\frac{1}{2} J1, \frac{3}{2} \frac{3}{2}) W(1\frac{1}{2} T1, \frac{3}{2} \frac{3}{2})$$

The energy dependent part of the equation separated out for each isobar has the form:

$$\begin{aligned} H_E(\omega) &= I_E(\omega) \\ &- \frac{\lambda}{\pi} \left[1 + \frac{1}{\pi} \int \frac{dx \gamma(x-i\gamma)}{E - \omega - x + i\gamma} \right]^{-1} \int dx \frac{\gamma(x-i\gamma)}{E - \omega - x + i\gamma} H_E(x) \end{aligned}$$

A numerical method to study the quantity

$$\int_1^E |H_E(\omega)|^2 \rho(E, \omega) d\omega$$

in which $\rho(E, \omega)$ is a statistical factor, as a function of E is so designed that knowledge pertaining to the precise structure of $I_E(\omega)$ is not essential and information pertaining to the kernel function $\gamma(x-i\gamma)$ can be approximately estimated from available elastic scattering data. The results indicate that for isobars $JT = \frac{5}{2} \frac{1}{2}$ ($\lambda = \frac{1}{3}$) and $JT = \frac{3}{2} \frac{3}{2}$ ($\lambda = \frac{4}{9}$), resonance phenomena indeed exist within an energy range estimated to correspond to laboratory pion kinetic

energy of 850 mev. to 1.2 bev., quite compatible to the experimental observation. But due to the lack of quantitative significance of the numerical method, a precise correlation between the predicted resonance maxima and the observed peaks cannot be unambiguously established. Both the two isobars might contribute to the experimental 950

mev. peak, or only $\frac{5}{2} \frac{1}{2}$ isobar contributes to this peak while $\frac{3}{2} \frac{3}{2}$ isobar should be assigned to the 1.3 bev. peak.

Resolution of this ambiguity needs more refined dynamical work, such as the inclusion of the structure of the inhomogeneous function.

Evidences necessary to confirm the reality of this model have to be supplied by experimental verification of certain angular relations and branching ratios characteristic of the coupling scheme used in this model. A typical phenomenological analysis reveals the most practical and lucrative method is to test the isobar $JT = \frac{5}{2} \frac{1}{2}$ for which, provided the resonance indeed occurs in the neighbourhood of 950 mev., then at this energy:

- (1) The nucleon recoil should be isotropic,
- (2) The two outgoing pions should have identical angular dependence with respect to the incident pion,
- (3) The reaction $\pi^- + p \rightarrow \pi^- + \pi^0 + p$ is extremely rare,
- (4) The ratio
$$\frac{\sigma(\pi^- p \rightarrow \pi^- \pi^+ n)}{\sigma(\pi^- p \rightarrow \pi^0 \pi^0 n)} \approx 2$$

Microfilm \$2.50; Xerox \$4.40. 81 pages.

PHYSICS, SOLID STATE

EXPERIMENTAL DETERMINATION OF THE SPECIFIC HEATS OF SODIUM, COBALT, MANGANESE, AND COBALT-IRON BELOW 1°K.

(L. C. Card No. Mic 60-1182)

Roger Edgar Gaumer, Ph.D.
The Ohio State University, 1959

A knowledge of the specific heats of metals at temperatures less than 1°K. is an invaluable aid in the formulation of the basic theory of solid state physics. The measurements described here were undertaken in order to provide information about the alkali metals and the transition metals. The specific heats of sodium, cobalt, manganese, and a cobalt-iron alloy were determined in the temperature range 0.35-3.5°K.

A magnetic refrigerator calorimeter was used to provide the low temperature environment necessary for these measurements. After precooling to 1.1°K. with liquid nitrogen and liquid helium, the temperature was lowered by means of the adiabatic demagnetization of a paramagnetic salt. A superconducting thermal switch, actuated by a zero-power superconducting solenoid, was employed as a means of achieving alternate thermal isolation or thermal connection of the sample with the low temperature environment.

Carbon resistance thermometers were used to determine the temperature change which resulted from the addition of a known quantity of heat to the sample. The calorimetric techniques are described, and certain phases of experimental cryogenics are discussed.

The specific heat of sodium was found to be $C = 1.32 T + 0.485 T^3$ millijoule/mole-°K. There was no evidence of anomalous behavior of the specific heat in the temperature range 0.35-3.5°K. The specific heat of the cobalt was $C = 5.1 T + 3.5 T^2$ millijoule/mole-°K., thus clearly indicating the presence of a hyperfine coupling contribution to the specific heat. The cobalt-iron alloy was of face-centered-cubic crystal structure and contained 6.5 weight per cent iron and 93.5 weight per cent cobalt. The specific heat of the alloy was determined to be $C = 7.1 T + 3.1 T^2$ millijoule/mole-°K. A cast cylinder of pure manganese was measured and the specific heat from 0.5-3.5°K. could be expressed as $C = 12.1 T + 0.6 T^2 + 0.5 T^3$ millijoule/mole-°K. The expression for manganese indicates the presence of both a hyperfine and a spin-wave contribution to the specific heat, in addition to the usual electronic term.

The basic theory of lattice and electronic specific heats is outlined, and the band theory of metals is discussed. The theory of the hyperfine coupling between a nucleus and the electronic orbital and spin momentum is developed. The spin-wave theory is discussed in connection with a specific heat contribution which arises in ferromagnetic and anti-ferromagnetic substances.

The experimental results are analyzed and discussed in the light of present theory.

Microfilm \$2.50; Xerox \$6.00. 123 pages.

ZIRCONIUM L SERIES X-RAY EMISSION AND ABSORPTION SPECTRA

(L. C. Card No. Mic 60-1197)

Robert James Liefeld, Ph.D.
The Ohio State University, 1959

The L series x-ray emission and $L_{II,III}$ absorption spectra of zirconium have been studied in an attempt to elucidate the energy band structure of the valence electrons in this material. A two-crystal spectrometer equipped with quartz crystals was used to obtain the data.

Emission spectra were excited by direct electron bombardment of high purity zirconium metal targets. Data on the entire emission spectrum were obtained, but particular attention was paid to the $L\gamma_1$ and $L\beta_2$ lines, which involve transitions between the valence electrons and the L_{II} and L_{III} inner levels respectively. It was necessary to record the $L\gamma_1$ line as quickly as possible after cleaning the target in order to reduce the effects of contamination which occurred even with operating pressures of about 4×10^{-8} mm Hg in the x-ray tube.

The observed shape of the $L\gamma_1$ line was used to obtain an estimate of the energy density of states times transition probability in the valence band of zirconium. This estimate was made by folding a Lorentzian curve whose width was equal to the combined widths of the L_{II} inner level and the spectral window function with an assumed trial function. The trial function was adjusted until a

reasonable fit with the observed $L\gamma_1$ contour was obtained. The inner level width and shape were determined with the aid of the L_{III} level width, the observed widths and shapes of the zirconium $L\alpha_1$ and $L\beta_1$ emission lines, and (1,-1) rocking curves at the $L\alpha_1$ and $L\beta_1$ wavelengths for the quartz crystals. The width and shape of the spectral window function were taken to be those of the (1,-1) rocking curve for the quartz crystals at the $L\gamma_1$ wavelength. The trial function which resulted in the best fit has a fairly steep high frequency edge and decreases smoothly toward the lower frequencies. There is no evidence for the double peaked structure predicted for d-type states in first period transition elements. It is proposed that this curve represents the probable level density of states of predominantly d-type symmetry times transition probability in the occupied portion of the zirconium valence band.

The absorption spectra of several zirconium absorbers were obtained over a wavelength interval including the L_{II} and L_{III} absorption edges. Two of the absorbers studied were prepared from chemically etched rolled metal foil, and a third was prepared by condensation of zirconium thermally evaporated from a molten pendent drop in a vacuum. The spectrum of the latter absorber showed a large absorption maximum several eV wide at each absorption edge. The spectra of the etched foil absorbers, however, did not show such structure. Comparison of these absorption spectra with each other and with that of zirconium oxide leads to the conclusion that the curves obtained with the etched metal foils are more characteristic of the bulk metal. It is also suggested that some metallic absorption spectra which have been reported in the literature and which show prominent "white lines" may, in fact, not be characteristic of the pure metals involved.

Microfilm \$2.50; Xerox \$5.00. 99 pages.

SOME MAGNETIC PROPERTIES OF IRON OXIDE MICROPOWDERS

(L. C. Card No. Mic 60-955)

Lynn Alexander Keeling Watt, Ph.D.
University of Minnesota, 1959

The variation of coercive force with temperature for magnetite and gamma-ferric oxide powders has been studied over the temperature range 2°K - 300°K. Three Fe_3O_4 powders were studied which contained multidomain particles. These particles were obtained from crushed taconite ore. They were irregular in shape and the arithmetic mean particle diameters for the three powders were 2.7 microns, 16.6 microns and 65.0 microns. For these powders the coercive force was found to depend on the crystalline anisotropy constant K_1 . At $T = 130^\circ K$, where

$K_1 = 0$, the coercive force passed through a minimum; at the transition temperature, 118°K, where K_1 increases by a factor of ten, the coercive force showed a large increase. At 5°K the coercive force reached a maximum.

A powder containing mostly single-domain Fe_3O_4 particles was obtained from the yellow pigment oxide $FeO.OH$ by a chemical procedure. These particles were acicular in shape with a mean axial ratio of 8/1 and a mean major-axis length of 0.5 microns. The variation of coercive force with temperature for these particles was consistent with that expected from the relationship between H_c and the predominant anisotropy.

Two $\gamma-Fe_2O_3$ powders were studied; on the basis of previous theoretical and experimental work one of the powders was expected to contain mostly single-domain particles, the other mostly multidomain particles. These particles were also grown from the pigment oxide and were also acicular. The mean axial ratio for the single-domain particles was 6.5/1, for the multidomain 3.3/1. The mean length was about 0.55 microns for both. For these powders the coercive force increased with decreasing temperature, the rate of increase being greater for the single-domain particles.

For the multidomain magnetite powders it was found that the coercive force below the transition temperature depended on the magnetic history of the sample. If the sample was saturated at 77°K, warmed to room temperature, and then recooled in zero external field, the value of the coercive force was lower than that obtained when the sample was demagnetized at room temperature before cooling.

A series of powders of the form $Fe_2O_3 \cdot x FeO$ were studied for $x = 1.00$, $x = 0.76$, $x = 0.50$, and $x = 0.00$. $x = 1.00$ corresponds to stoichiometric magnetite and $x = 0.00$ to pure $\gamma-Fe_2O_3$. Oxidation of the powder to $x = 0.76$ produced a shift of about 10° in the transition (from 114°K to 104°K). Further oxidation to $x = 0.50$ shifted the transition to 92°K. The effect of the transition on the coercive force was still present although greatly reduced. These results provide evidence that the change in crystal structure which occurs at the transition temperature is less sensitive to the presence of cation vacancies than the ordering of the Fe^{3+} and Fe^{2+} ions which also takes place. The latter effect is suppressed by oxidation to $x = 0.93$.

Measurements of the coercive force as a function of temperature and as a function of compression have been made on a single powder in both the Fe_3O_4 form and the $\gamma-Fe_2O_3$ form. These results indicate that this powder contains mostly single-domain particles in the $\gamma-Fe_2O_3$ form and mostly multidomain particles in the Fe_3O_4 form. This is in agreement with the theoretical prediction that the critical single-domain size for acicular $\gamma-Fe_2O_3$ particles should be somewhat larger than that for Fe_3O_4 .

Microfilm \$2.50; Xerox \$4.80. 91 pages.

PHYSIOLOGY

EXPERIMENTALLY INDUCED RIGHT-SIDED CONGESTIVE HEART FAILURE IN SWINE

(L. C. Card No. Mic 60-1032)

Nicholas H. Booth, Ph.D.
University of Colorado, 1959

Supervisor: Professor Clarence A. Maaske

The induction of chronic right-sided congestive heart failure in animals which would resemble the pathological entity in man has been the subject of considerable research during the past several years. The difficulty of consistently producing this syndrome in the dog led to the decision to use swine, especially since, functionally and anatomically, the pig was considered to parallel man more closely than the dog. Partial occlusion of the main pulmonary artery of the piglet resulted in chronic congestive heart failure accompanied by the cardinal signs of clinical heart failure. Induction of congestive heart failure in swine was particularly significant since cardiac failure was induced by a single surgical maneuver, as contrasted to procedures used in the dog, which require surgery in series or the infliction of multiple insults to accomplish comparable results.

Morphologically, the alterations noted in swine with congestive heart failure were similar to those occurring in man. Necropsy examination revealed the presence of right atrial and right ventricular hypertrophy, as well as dilatation, hepatomegaly and ascites. Marked distension of the central veins and passive congestion of the liver and spleen were evident. The kidneys exhibited no gross pathological changes.

Physiological studies included weekly measurements of body weight, total body water, blood and plasma volumes, hemoglobin, hematocrit, cardiac rate, venous and right intracardial pressures, and urinary excretion of electrolytes. The average body weight of the pigs with cardiac failure was less than the weight of the control animal throughout the latter half of the experimental study in spite of grossly evident ascites. Moreover, the increase in total body water did not appear to be commensurate with the amount of ascites observed. The plasma and blood volumes, hemoglobin and hematocrit values did not change appreciably in the pigs with cardiac failure. Inasmuch as the total circulating blood and plasma volumes did not increase, and since distended central veins and passive congestion were observed, the assumption was made that a shift of blood from the arterial and/or peripheral regions occurred through vaso- or venoconstriction.

The immediate elevation of venous pressure following the pulmonic stenosis precluded a study of the temporal relationships of electrolyte and water retention with that of the hemodynamic changes. The rise in venous pressure following constriction of the pulmonary artery was attributable to the mechanical influence of the stenosis. This response could perhaps have been avoided by beginning with a partial constriction of lesser magnitude since the degree of stenosis increases in proportion with the rapid growth rate of the piglet. While electrolyte and fluid retention have been considered to be an early manifestation

in the pathogenesis of cardiac failure, no one has successfully demonstrated the temporal relationships of these changes. Of the many studies involving renal, hepatic, and adrenal functions in cardiac failure, the triggering mechanisms responsible for electrolyte retention still remain obscure. Additional studies relating to the cerebral circulation could be of significance in further elucidating the mechanisms involved. Preliminary observations indicate that swine may be useful in the study of cerebral blood flow in congestive heart failure.

Microfilm \$2.50; Xerox \$7.80. 170 pages.

STUDIES ON THE INTERRELATIONSHIP BETWEEN THE HORMONES OF THE ADRENAL CORTEX AND RENAL AMMONIA PRODUCTION

(L. C. Card No. Mic 60-982)

Alfred Boris, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor E. S. Gordon

The adrenalectomized rat excretes less urinary ammonia when subjected to a given degree of acid loading than does the intact rat subjected to the same treatment. The present study presents evidence showing that this deficiency in urinary ammonia in the adrenalectomized animal can be corrected by the administration of either glucocorticoids or mineralocorticoids. On the basis of steroid weight, the mineralocorticoids manifested a more potent effect upon this mechanism than did the glucocorticoids. Data is presented on two human subjects exhibiting adrenal cortical disorders. The effect of withdrawal of steroid maintenance, during concurrent acidosis induced with ammonium chloride, upon urinary excretion of ammonia is reported.

The effects of adrenalectomy, acidosis induced with ammonium chloride, and treatment with adrenal corticoids upon the "in vitro" activity of glutaminase, asparaginase, guanase, adenosine deaminase, and carbonic anhydrase were studied. No significant changes were observed, as a result of the treatments employed, in the activities of glutaminase, asparaginase, guanase, or carbonic anhydrase in rat kidney homogenates. Pretreatment of rats with hydrocortisone or aldosterone resulted in significant increases in the activity of adenosine deaminase.

Studies are presented on renal tissue levels of sodium and potassium, urinary excretion of these ions during acidosis, and upon the "in vitro" activity of glutaminase in media containing various concentrations of sodium and potassium, which seem to implicate the renal cellular level of potassium as an important factor in renal ammonia production. It is concluded on the basis of this experimental evidence, and on supportive reports in the literature, that the loss of intracellular potassium results in an increased synthesis of urinary ammonia.

Microfilm \$2.50; Xerox \$5.20. 101 pages.

POLITICAL SCIENCE

POLITICAL SCIENCE, GENERAL

THE POLITICAL BEHAVIOR OF THE NEGROES IN CINCINNATI, OHIO AND LOUISVILLE, KENTUCKY.

(L. C. Card No. Mic 60-643)

Ernest M. Collins, Ph.D.
University of Kentucky, 1950

The purpose of this study is to make an analysis of the factors affecting the voting behavior of Negroes in Louisville, Kentucky and Cincinnati, Ohio for the period from 1928 to 1948. In making this analysis, the aspects of Negro politics that have received primary consideration are: (a) The struggle for political status, (b) The extent of participation in elections, (c) The nature of bills proposed by Negro legislators, (d) The Negro vote in relation to the New Deal program.

The original source material used in the preparation of this study consisted primarily of Negro and white newspapers in Cincinnati and Louisville, and the official election returns of Jefferson County, Kentucky and Hamilton County, Ohio. To fill in some of the gaps in information, interviews were conducted with party leaders and public officials in positions to make pertinent observations on the political activities of Negroes.

This study reveals that the Negroes in Cincinnati and Louisville made steady progress in improving their political status in the period from 1870 to 1948. However, the Negro political leaders are aware of and resentful of the fact that their political status is inferior to that of the whites. Fortunately for the Negroes, competition between the two major political parties is such that they hold the balance of power in many elections.

Practically all the Negro voters in Cincinnati and Louisville, during the period from 1870 to 1921, supported the Republican Party. Beginning in 1921, there were some differences of opinion among the Negro leaders as to whether the policies of the Republican Party merited their support. However, the Negro voters continued to support the Republican candidates during the period from 1921 to 1932, but with much less zeal than previously shown. During this period, some of the Negroes indicated a willingness to "take a walk", but they had no place to go, since the Democrats did not show a willingness to solicit the favor of those Negroes indicating a desire to leave the Republican Party.

As the Democratic Party manifested more interest in the Negro voters, they became more aggressive in expressing their dissatisfaction with the Republicans.

In the period from 1932 to 1948, there were definite changes in the party affiliation of many of the Negro voters in both Cincinnati and Louisville. The election returns from 1948 revealed that approximately 80% of the Negro voters in Cincinnati voted for the Democratic candidate for president, compared to 35% in Louisville. The reluctance of the Negroes in Louisville to switch to the Demo-

cratic Party was in part attributable to the failure of the party to recognize and reward them for their support.

The primary factor influencing many of the Negroes to change their party affiliation during the period of 1932 to 1948 was the economic features of the New Deal program. In the depression concrete benefits like jobs, relief payments, unemployment compensation, and old-age pensions were more attractive to the Negro voters than abstract promises of civil rights. Many of the Negro voters looked upon President Roosevelt as a political Moses, who could lead them to "the promised land" of economic security. They supported President Truman in the belief that he would continue the economic features of the New Deal program, with an added attraction of civil rights.

Microfilm \$3.05; Xerox \$10.80. 236 pages.

CHARLES DE MONTALEMBERT AND THE DECLINE OF LIBERAL CATHOLICISM

(L. C. Card No. Mic 60-1235)

James C. Finlay, S. J., Ph.D.
Duke University, 1959

Supervisor: John H. Hallowell

In the wake of the French Revolution and the Napoleonic era the Catholic Church in Europe was faced with many problems, not the least of which was a problem of adjustment to the new political order. The Congress of Vienna failed in its attempt to restore divine right monarchy in France. Even before the July Revolution of 1830 political power was gradually slipping out of the hands of the ultra-royalists and into the control of groups that identified themselves as liberal. The July Revolution represented the triumph of the liberals over the Bourbons and divine right monarchy. The Catholic Church which had, in France, been so intimately associated with the monarchy and the House of Bourbon, was faced with a new regime that professed allegiance to the ideas of liberty, civil rights and Church disestablishment that were derived from the Revolution of 1789. For the better part of a century the official Church and individual Catholics had to struggle with the problem of what attitude to take towards this new form of government which seemed committed to an anti-Christian philosophy.

Basically there were two responses to the situation, the one, uncompromising hostility to the new regime, and the other, an effort to accommodate Catholic teachings to what was considered best in liberal ideology and practice. This second response was that of the liberal Catholics. Felicite Lamennais began this movement of reconciliation while he was a priest in good standing. He was assisted in this endeavor (1830-1832) by a number of young Catholics among whom Charles de Montalembert was the most prominent. In the newspaper l'Avenir they championed

political freedom, popular sovereignty, parliamentary government and the separation of Church and State. On this basis they felt the Church could establish an accord with the liberal society, and, in a spirit of mutual respect, while the liberal society guaranteed freedom to the Church, the Church could render liberal society an essential service by bringing its spiritual influence to bear on the life of its citizens. Lamennais left the Church in 1834 when Rome condemned certain of his doctrines as errors and exaggerations. His departure, however, did not end the liberal Catholic effort to achieve a rapprochement between the Church and the liberal society. It continued with Montalembert now serving as the leading exponent of the ideal.

In this dissertation we have attempted to present Montalembert's background, his evaluation of the problem that faced French Catholics in the political world they inhabited and the solution that he presented, his formula, that is of liberal Catholicism. Going on from there we describe how Montalembert, after impressive political achievements under the banner of liberal Catholicism, actually contributed to the decline of the movement by involving it in a program of political and social reaction after the Revolution of 1848.

Montalembert's theory of liberal Catholicism might be summarized as follows: there was no necessary or fundamental contradiction between the Catholic faith and liberal government; in the post-Revolutionary world the Church could no longer count on a privileged legal position to enable it to influence society; the best practical protection for the Church's spiritual as well as temporal interests in the modern world was to be found in the civil rights of its members. As corollaries of these liberal Catholic premises there followed: the destruction of what was commonly regarded as the necessary connection between Catholicism and divine right monarchy; the increased significance of the layman's role in politics and in other areas where public opinion was a factor; the insistence that separation of Church and State need not and in fact should not imply mutual hostility or the secularization of the State.

This theory was popular and influential in the mid-nineteenth century and then went into a definite decline. Scholars have attributed the decline to the papal condemnations of liberalism specifically, those included in the so-called *Syllabus of Errors* (1864). In this dissertation we attempt to establish the fact that the reactionary orientation which Montalembert had given to liberal Catholicism after 1848, had already alienated the popular support that was needed if this theory was to be reduced to practice.

Printed sources have been used almost exclusively in the research for this thesis: Montalembert's own works, very many of his letters printed either in book form or in magazine articles, contemporary newspapers as well as a large number of books and articles pertaining to the man, the subject and the period.

Microfilm \$4.65; Xerox \$16.45. 361 pages.

SOME ASPECTS OF REPUBLICAN AND DEMOCRATIC PARTY FACTIONALISM IN KANSAS

(L. C. Card No. Mic 60-1142)

Marvin Andrew Harder, Ph.D.
Columbia University, 1959

Kansas was admitted to the Union on January 29, 1861. Between that time and the general election of 1958 the voters of Kansas participated in twenty-four presidential elections, eighteen senatorial elections, and forty-nine gubernatorial elections. Republican candidates won seventy-five, eighty-three, and eighty-four percent of these contests, respectively. Only once during this ninety-seven-year period did the Democrats control both houses of the state legislature. Though their candidates for state offices generally polled in the neighborhood of forty percent of the state-wide vote, they were seldom able to win more than twenty-five percent of the legislative seats or county offices, a fact that is related to the generally uniform distribution of the state-wide ratio of Republican to Democratically-inclined voters throughout most of the state's 105 counties.

But in spite of their decidedly minority position, the Democrats have consistently contested for most major offices in Kansas. The size of their state-wide vote permitted them to hope for victory during those years when a segment of the Republican party electorate was sufficiently dissatisfied with one or more of their party's candidates to cause them to withhold their support or vote for one or more Democratic candidates. On six occasions (1882, 1912, 1922, 1930, 1936, and 1956) the Democratic gubernatorial candidate was elected to office.

Because Republican party factionalism was a major contributing factor in five of the six elections won by Democratic gubernatorial candidates (a thesis supported in Chapter III of the dissertation), the author was led to investigate the circumstances (Chapter IV), the battlegrounds (Chapter V), and the consequences (Chapter VI) of party factionalism in Kansas.

So stated, the problem of this study was not to locate and describe all of the influences which have shaped the character of Kansas politics, but rather to analyze the phenomenon of party schism, treating Kansas politics as a kind of microcosm from which data may be derived to illustrate the nature and consequences of such schisms. While it was assumed that Kansas politics are not atypical, no attempt was made to validate this assumption.

In Chapter I a faction is defined as a group of people who are members of a party electorate and who share an interest distinct from that of the party electorate as a whole. In Kansas, factions have varied in size. While initially most of them were composed of a small group of persons within the party organization whose aspirations for leadership were not accommodated by the leaders of the party, they came to include non-organizational members of the party electorate whose discontents were effectively exploited by the nuclei of the factions. Where the nuclei of factions were successful in involving a substantial number of the non-organizational party electorate in their intra-party struggle for power, the outcome of the inter-party contest became unpredictable. The circumstances of these factional schisms are described in Chapter IV.

Chapter V is devoted to an analysis of the battlegrounds of party factions in Kansas, specifically primary elections, state party conventions and council meetings, and county or local party caucuses.

The concluding chapter (Chapter VI) suggests the principal consequences of party factionalism. In general, there have been two kinds of effects: (1) Republican factionalism has contributed to the persistence of Democratic party activity and thereby promoted a "kind" of two-party system; (2) but Democratic party factionalism, in particular, has adversely affected the capacity of the party organization to perform such functions as candidate selection, issue formulation, fund raising, and vote mobilizing.

Microfilm \$3.45; Xerox \$12.15. 267 pages.

**THE OHIO ADMINISTRATIVE PROCEDURE
ACT, 1943-1959: AN ANALYSIS AND
EVALUATION OF ITS EFFECT.**

(L. C. Card No. Mic 60-1183)

Richard Fickes Heiges, Ph.D.
The Ohio State University, 1959

This is a study of the operations of the Ohio Administrative Procedure Act, enacted in 1943 and amended in 1945, which prescribed uniform standards for the procedures of certain regulatory agencies in order to protect individuals and groups from arbitrary administrative actions. Although the judicial review provisions of this Act are considered, emphasis is placed on the rule-making and adjudication sections and their effects upon (1) selected regulatory agencies and (2) individuals and groups affected by the action of these agencies. Some attention is also given to administrative procedure legislation in the federal government, in Britain, and in other states.

The introductory chapters are concerned with the nature of administrative procedure laws in places other than Ohio, with the genesis of the Ohio statute, and with its structure and content. Subsequent chapters are devoted to an analysis and evaluation of the rule-making and adjudication provisions of the Act, to proposed changes in the statute, and to an estimate of the likelihood of such changes.

The evidence assembled in this study suggests that some serious deficiencies are to be found in the statute, including such matters as (1) inadequate public notice of proposed rules and rule-making hearings; (2) confusing variety in form and content of administrative rules; (3) the lack of centralized codification, publication, and distribution of rules; (4) the tendency of agencies to exercise emergency rule-making powers to avoid appeals to court; (5) the lack of rules or standards for admitting evidence at hearings; (6) the failure of agencies to deliver transcripts of proceedings to court when agency order has been appealed; (7) the lack of uniform procedures through excessive exemption of regulatory agencies from provisions of the Act; and (8) insufficient separation of prosecution and judicial functions within regulatory agencies. Despite these weaknesses, the evidence also suggests (1) that the statute has largely fulfilled the objectives of its supporters by establishing effective safeguards for the rights of individuals and groups subject to the regulatory

operations of administrative agencies and (2) that administrative procedure legislation can be effective without obstructing regulatory programs.

Changes in the Act which are recommended in this study include (1) periodic publication of proposed administrative rules and hearings by some central state agency; (2) assignment of advisory powers to the attorney general in the drafting of rules; (3) codification, publication, and distribution by some central state agency of all rules in an administrative code and monthly register; (4) establishment of certain restrictions on the practice of state legislators as attorneys before state agencies; (5) formulation of a clear statement in the Act of rules of evidence for adjudication hearings; (6) permission for appeals by affected parties to courts from agency orders continuing emergency regulations; (7) awarding of decision to appellant by courts if agency fails to file transcript of proceedings within twenty days after agency receives notice of appeal from party affected by agency order; (8) use of either private attorneys or assistant attorneys general not attached permanently to agencies as hearing officers; and (9) placement of most agencies under the provisions of the Act.

Microfilm \$5.30; Xerox \$18.70. 415 pages.

**SOME AMERICAN OPINION OF THE
SOVIET UNION, 1933-1939.**

(L. C. Card No. Mic 59-4209)

Robert Joseph Horgan, Ph.D.
University of Notre Dame, 1959

The focal points of U.S. opinion both official and unofficial include: U.S. recognition (1933); the debt negotiations (1934-1935); the Comintern Congress (1935); the purge trials of the middle 1930's; and Soviet military action against Poland on Finland (1939).

Popular opinion almost universally believed that our recognition would increase trade with the Soviet Union and thus help us out of the depression. State Department opinion emphasized the need for Soviet acquiescence to our demands on technical matters which had delayed recognition for sixteen years.

Liberal circles blamed our government for failure to settle the debt question while Secretary Hull and Ambassador Bullitt tried vainly to reach a settlement. Though this question was never settled, U.S.-Soviet trade increased, but not to the levels predicted by the most enthusiastic proponents of recognition.

Both official and popular opinion condemned the Soviet government for permitting the Comintern Congress to convene in Moscow in apparent violation of the Litvinov pledge of 1933. Ambassador Bullitt was furious, the State Department sent a note of protest, conservative public opinion urged the severance of diplomatic relations, and the liberals wondered what all the sound and fury was about.

During the years of the purge trials some liberal opinion (*Christian Century*) changed to an anti-Communist position while the rest (*New Republic*, *The Nation*) continued their support until the aggressions against Poland and Finland. The State Department could say nothing about

the purges--exclusively an internal matter, though our diplomatic personnel in Moscow expressed divergent views. The professional personnel were more accurate in their evaluations than the politically appointed ambassador.

The Soviet attacks on Poland and Finland virtually eliminated all pro-Soviet sentiment in this country with the exception of the Daily Worker. Popular opinion was very strong, yet the government responded to the events with cautious criticism. Our strongest protest was merely a note declaring our neutrality. The Soviet bombing of defenseless Finnish cities again produced petitions for severing diplomatic relations, but this was a step neither the State Department nor the President seriously considered, if at all. Instead, the President pleaded for a "moral embargo" against the shipment of war goods to either side.

These were the years of the United Front policy, a policy which sought to make democracy and communism synonymous terms. There were many in the United States who were confused or persuaded by this campaign. One publication, Commonweal, was able to see through this Communist smoke-screen. For this publication, a more accurate alignment of ideological forces was to place communism and fascism together under the heading of "Dictatorship," the threatening enemy of democracy.

No attempt was made in this paper to determine or analyze the reasons why a particular opinion was expressed. Similarly the benefit of hindsight could not justify the evaluating of opinions as being right or wrong. However, it would not seem unfair to say that some opinions were faulty in the light of the available information. Even more significant is the fact that while pro-Communist editorialists changed to an anti-Communist opinion, not one publication switched the other way.

Despite the sizeable segment of public opinion which believed the Soviet government to be an evil equal to that of Nazi Germany or Fascist Italy, there never was a comparable volume of opinion on specific courses of action which could or should be taken. This explains in part our lack of political and military preparedness as we drifted into the Second World War.

Microfilm \$4.85; Xerox \$17.10. 378 pages.

THE RELATIONSHIP OF CONGRESSIONAL COMMITTEE ACTION TO A THEORY OF REPRESENTATION

(L. C. Card No. Mic 60-1003)

Charles Oscar Jones, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor Ralph K. Huitt

This is an exploratory study of a congressional committee, which seeks to develop a series of propositions about political representation. The study assumes that a process of representation can be discovered by examining in detail the way in which representatives work on legislative policy. The emphasis is on the representative as the critical factor in representation on policy, not the represented.

Preliminary hypotheses were:

1. The critical relationship in representation on a policy is between the representative and various interests in his legal constituency but factors related to the legislature and the representative himself modify this relationship.
2. A "policy" constituency is defined by the representative during action on a policy. This "policy" constituency consists of those constituency interests which are affected by a policy.
3. The representative relies most on his "policy" constituency for action where the conflicts are least (usually the subcommittee level).

The work of the members of the House Agriculture Committee (85th Congress, second session) on the major farm legislation in 1958 (H. R. 12954 and S. 4071) is the subject of study. All committee and subcommittee hearings, pertinent House debates, reports and bills were read and analyzed. Thirty of the thirty-four members of the Agriculture Committee (plus interest group representatives) were interviewed.

Following a detailed analysis of the legislation and the members' evaluation of it, several hypotheses were stated about representation on a legislative policy. The most important of these are as follows:

1. If the legislator-representative is free to do so, he will base his policy actions on his concept of those interests in his "legal" constituency which are affected by the policy at hand.
2. If the legislator-representative is not free to base his actions wholly on interests in his constituency, then the representative's policy actions will be modified by factors which vary in influence at different stages of the legislative process. These factors are related to the legislature (i.e., political parties, interest groups, procedures) and the representative himself (i.e., ability, knowledge, interest, etc.).
3. If the legislator-representative acts on the basis of interests in his constituency affected by a policy, then he will define a "policy" constituency for action on that policy.
4. If a policy directly affects interests in a representative's legal constituency, then he will rely on his "policy" constituency for action. The less that a policy directly affects interests in a representative's legal constituency, the more he will rely on political party for action.
5. If a legislator-representative has a multiplicity of demands upon him in any policy action or series of actions, he can satisfy many of these demands because of the multiplicity of action points in the legislative process.

In conclusion, a theoretical definition of legislative representation was developed. On the basis of this study, legislative representation was found to be a process, resulting in political action to resolve conflict, which involves a relationship between the representative and his constituency (defined by law and by the representative

himself in a policy action) and which is influenced by the characteristics of the legislature within which it occurs.

Microfilm \$6.55; Xerox \$23.20. 515 pages.

THE ESTABLISHMENT OF REGIONAL GOVERNMENT IN THE REPUBLIC OF INDONESIA

(L. C. Card No. Mic 60-830)

Gerald Seymour Maryanov, Ph.D.
Indiana University, 1959

In the Republic of Indonesia, the program for establishing units of regional government endowed with a measure of autonomy is called "decentralization." The program is authorized by the constitution, outlined in legislation, and has been in the course of implementation since 1950.

The variety of social forms included in Indonesia makes the organization of local government difficult. Policy suggestions were limited by the conscious rejection of Dutch-designed federalism, and consequent adoption of the unitary form. With the adoption of the unitary structure, it was also assumed that there would be decentralization. The program is justified in Indonesia by reference to the demands of democracy, and the need for local participation in the governing of local affairs, as well as the need for accommodating popular desires for local self-government.

The decentralization program was designed to work within the confines of the unitary state. However, protests emanating from various regions questioned the implementation of the program and demanded quicker as well as more action. These protests generally were concerned with either of two questions: the appointment of the chief official of a region, and the distribution of developmental resources. The protests were labeled provincialism, and their continuation gave rise to the regional problem and the rebellion of 1958.

Three levels of government are envisaged as being autonomous: the province, the regency, and, ultimately, the village. The regions are supposed to be "natural" units rather than artificial divisions. Four sets of factors are referred to in the definition of "natural," though local political pressures may override more "rational" considerations.

Each region, as it is granted autonomy, is endowed with a regional representative council, and a regional executive board, the two bodies being known as the "organs of government." There is also an official known as the Kepala Daerah (Head of the Region). The councils are to be elected. The first elections took place in 1957, mostly in Java. The representative council is the supreme governing body of the region.

A major difficulty has been the determination of the position of Kepala Daerah. The original dual role, as both central and regional official, was unsatisfactory. While the central government tried to make the office exclusively central, the final solution was to make the office exclusively regional.

The regions are to govern their own affairs. Originally, the central government was to control residual functions, while the regions governed only those matters specifically assigned to them. This has been reversed to leave residual

powers with the regions--providing that they do not take up any matter governed by a higher level. The central government maintains an additional measure of control through certain supervisory functions. Further, central control of financial resources are felt to be a hindrance to autonomous self-government. In 1957, regulations were issued to ensure sources of finances to the regions, but it is doubtful that they will be considered sufficient.

As of the end of 1958, the pattern of regional government seemed well established. But debate has concentrated more on forms than on content, and regional practices have not yet indicated what role regional government will play in the general political life of the country. The regional problem continues, but it is not likely to be solved until more general political questions for the whole country are answered.

Microfilm \$5.05; Xerox \$17.80. 395 pages.

LANGUAGE, LOGIC, AND POLITICAL PHILOSOPHY.

(L. C. Card No. Mic 60-834)

Karl O'Lessker, Ph.D.
Indiana University, 1959

For the better part of this century political philosophy has been suffering from what appears to be a crise de conscience, brought on, in large measure at least, by certain developments in epistemology and philosophy of science. The most pervasive of these are the doctrines of philosophical analysis, whose proponents have called into question the very foundations of any normative enterprise such as moral or political philosophy. The purpose of the present essay is to show that these doctrines are either mistaken in themselves or incapable of doing the job (e.g., the a priori elimination of metaphysics) that is claimed for them. This in turn will enable us to assert the logical warrantability of political philosophy.

After a brief consideration of the principal doctrines of analysis we turn to the ethical theories, emotivism and informalism, which have been developed by Analysts since the early 'thirties. We find these faulty in several crucial respects, especially in their lack of attention to the empirical status of instrumental value judgments, and we then go on to present an alternative ethical theory which appears more congruent with the facts of moral experience; the chief feature of this theory being a demonstration of the logical relationship between moral judgments and the total value system of a society.

We then proceed to an examination of analytic techniques as they have been applied to political philosophy; the one major example of this is T. D. Weldon's Vocabulary of Politics. We find that Weldon's analysis, while valuable in some respects, leaves open certain crucial gaps which the analytic method is incapable of filling: for example, he offers several criteria for the rational evaluation of governmental systems, but then has to admit that the criteria themselves are irrationally chosen. Relying on the ethical theory developed in the preceding chapter, we are able to show that this is a premature surrender to irrationalism.

In a final section we summarize the advantages and

disadvantages of analytic techniques for political philosophy. In general we find that analysis has much to offer for the solution of certain kinds of political perplexities, especially those in which the chief difficulties are of a fundamentally verbal nature. But we find, too, that the philosopher who restricts his investigations to only those that can be conducted with the techniques of analysis, is unnecessarily cutting himself off from the possibility of much broader accomplishments.

Microfilm \$2.50; Xerox \$7.60. 161 pages.

SOVIET AND INDIAN COMMUNIST POLICY IN INDIA 1935-1952.

(L. C. Card No. Mic 60-1157)

Gene Donald Overstreet, Ph.D.
Columbia University, 1959

In his pre-revolutionary writings Lenin formulated a comprehensive system of strategy (goals vis-a-vis classes) and tactics (techniques vis-a-vis the organizations of those classes). For the period of bourgeois-democratic revolution in Russia he proposed a four-class strategy whereby the proletariat would ally itself with the peasantry, petty bourgeoisie and bourgeoisie against feudalism; for the subsequent period of socialist revolution he proposed a three-class strategy whereby the proletariat would ally itself with the peasantry and petty bourgeoisie against capitalism. At the Second Congress of the Comintern in 1920, Lenin adapted the four-class strategy for the period of nationalist revolution in colonial countries; that is, he proposed a four-class strategy against imperialism. The Indian, M. N. Roy, rejecting the idea of collaboration with bourgeois nationalism, proposed the immediate application of the three-class strategy against capitalism in the colonies. Communist policy for India from 1935 to 1952 fluctuated between, and must be analyzed in terms of, these two strategic variants.

In 1935 the international Communist leadership gave formal sanction to the "united front" line, which was in essence the anti-imperialist strategy directed primarily against fascism. In India the new line required the unity of the national movement; the CPI made a formal alliance with the leadership of the Congress Socialist Party (a united front from above) and on that basis entered the Indian National Congress to attack its Gandhian leadership (a united front from below). The CPI succeeded in capturing a large part of the socialist organization and in gaining considerable influence in the Congress. In 1939, in order to maintain the unity of the Congress against a threatened left-right split, the CPI was forced to ally itself with the Gandhian leadership.

Between 1939 and 1941, Soviet policy for India changed little. The CPI, however, tended to move leftward: evidently anticipating a revolutionary situation, it resumed the attack against the Gandhian leadership and, indeed, the socialist leadership also, and on occasion it proclaimed an anti-capitalist strategy.

From 1941 to 1945, the CPI collaborated with British imperialism in the "people's war." After some delay and apparent reluctance, it devoted itself to promotion of political unity and maximum production for the war effort.

Soviet policy for India was vague and tentative during 1945-1947 and the CPI vacillated between the two variants of strategy, increasingly immobilized by inner-Party dispute. In 1947 the CPI proclaimed a policy of loyal opposition to the Nehru government, but its leftist element found support for an anti-capitalist strategy in international Communist (especially Yugoslav) publications. At this time a comprehensive debate was evidently proceeding in the international Communist community. With seeming international sanction the leftist element took control of the CPI in December 1947 and began preparation for proletarian revolution. The Indian government took effective measures of repression and the CPI's "revolution" produced only sporadic outbursts of terrorism.

By the middle of 1949 the international Communist leadership approved the Chinese model of revolution for Asia; again with seeming international sanction, another faction now assumed authority in the CPI to undertake agrarian revolution. This, too, failed, and in 1950-1951, on advice from its British Communist mentors, the CPI reverted to the anti-imperialist strategy, with a tactic of promoting regional particularism against Anglo-American influence and the national government.

This study of Communist policy for India, 1935-1952, indicates contrary tendencies on the part of the Soviet leadership and the CPI -- the former prone to the anti-imperialist strategy and the latter to the anti-capitalist strategy. It suggests also an important doctrinal inertia in the formulation of Communist policy for India.

Microfilm \$4.25; Xerox \$14.85. 329 pages.

THE CONSTITUENT ASSEMBLY OF INDIA AND THE PROBLEM OF INDIAN UNITY: A STUDY OF THE ACTIONS TAKEN BY THE CONSTITUENT ASSEMBLY OF INDIA TO OVERCOME THE DIVISIVE FORCES IN INDIAN SOCIAL AND POLITICAL LIFE DURING THE DRAFTING OF THE INDIAN CONSTITUTION.

(L. C. Card No. Mic 60-890)

Ralph Herbert Retzlaff, Ph.D.
Cornell University, 1960

The preservation and fostering of Indian national unity was a matter of primary concern to the framers of the Indian Constitution. During the independence struggle which preceded the constitution-making process several problems, rooted in the diversity of Indian social and political life, had emerged. These problems concerned minorities, federal relationships, and language and were often designated as communalism, provincialism or regionalism, and linguism. A characteristic common to them was the prior claim of community, province or linguistic group that arose in respect to the allegiance of those involved. In the sense that allegiance to these groups, essentially of a sub-national character, was placed above the sense of national allegiance, they posed a serious threat to Indian unity. The ramifications of each tended to cut across the entire constitutional structure, a fact which made their solution, if it can be spoken of as such, exceedingly difficult.

The task which confronted the Constituent Assembly

was to create constitutional provisions which would accommodate the diversities inherent in each of these problems, while unmistakably setting forth the primacy of the national interest.

The minorities problem involved the demand by the minorities for political safeguards, such as separate electorates, reservation of seats in the Cabinets, and of posts in the administrative services.

The federal relationships problem, the most complex of the three, involved the creation of a system of relationships between the union and unit governments in the fields of legislation, administration, and finance which would meet the demands of the units for greater autonomy and still not hinder the development of a strong, stable union government. The difficulties involved were enhanced by the marked differences between the units, some of which, such as the former Princely States, were politically and administratively quite backward. The danger of instability in the units was also quite evident.

The language problem concerned both the selection of an official national language as well as the demand for linguistic reorganization of provincial boundaries. The existence of a dozen major regional languages was the underlying factor in both of these issues.

The extent to which the Constituent Assembly was able to arrive at agreed solutions in respect to these problems varied. Where the issues remained unresolved they continued to exercise a divisive effect on Indian social and political life. Microfilm \$6.90; Xerox \$24.55. 541 pages.

A STUDY OF THE UNIVERSAL MILITARY TRAINING CAMPAIGN, 1944-1952.

(L. C. Card No. Mic 60-1049)

John M. Swomley, Jr., Ph.D.
University of Colorado, 1959

Supervisor: Professor Dayton D. McKean

In 1944 the War Department launched a campaign for a permanent program of compulsory military training for eighteen-year-old boys. The War Department's chief support came from the President, the American Legion and some other veterans' groups, the United States Chamber of Commerce, and the Citizens Committee for Universal Military Training. A counter-campaign was launched by a number of peace and pacifist groups. These groups organized the National Council Against Conscription and enlisted as their allies the major church, farm, labor, educational, Negro and temperance groups as well as a few veterans' organizations. Universal military training was a major issue until its legislative defeat in 1952. It was subsequently abandoned by the President.

This study describes and assesses the activities of these campaigns. Although the efforts to achieve universal military training during the first World War are also summarized, the study is not a history of the universal military training problem. The bulk of the study deals with the organization and operation of the campaign, including the strategy and tactics used, and an analysis of the pressures for and against universal military training. The study also deals with congressional attitudes, showing the

role political leadership, parties, and committees played in the consideration of universal military training.

The study is based upon source material, including the files of the National Council Against Conscription and its publication, *Conscription News*; the files of other organizations involved in the campaign; conversations and letters; and journalistic and similar materials which discuss the activities of the campaign. This is also a participant observer study since the writer participated in the campaign against universal military training from the beginning and after the first two years largely directed it.

In the course of this study a number of conclusions have been reached. They include: 1) Many of the large pressure groups in American society which have been organized for a specific purpose have secondary interests which they are likely to support only if another group takes the initiative in organizing a campaign, preparing materials, and watching legislative developments. The cooperation of diverse groups whose primary interests are often in conflict may be possible chiefly because of the initiative of another group. The role of a catalytic group is thus essential to any major civic campaign which seeks to have a minority interest accepted as the general interest. 2) Pressure groups have an important role to play in serving as a check on powerful government agencies. Large government bureaucracies with vested interests and an ability to create foreign or domestic security threats to bolster their demands, require a counter-structure as a check upon their power. The tendency of some congressional committees to identify their interests with those of administrative agencies such as the Department of Defense, and the careful cultivation of those committees by the officers of such agencies, lead to the conclusion that a counter-structure of organized pressure groups is essential to the democratic process. 3) The universal military training campaign demonstrated that the power of government is the formal expression of the authority of the various social relationships that sustain it. The President and a majority of congressmen were individually for universal military training when it was defeated in 1952. The laws and decisions of government do not necessarily express the real will of the persons who serve as legislators or executives, but demonstrate the adjustment to the pressures of public opinion reflected by basic social groups such as the church, school, labor, farm and other organizations.

Microfilm \$6.15; Xerox \$21.85. 481 pages.

POLITICS IN THAILAND

(L. C. Card No. Mic 60-881)

David Allen Wilson, Ph.D.
Cornell University, 1960

Thailand's society is simple and stable. Its political system is sophisticated and has been successful in meeting a variety of challenges.

Rural Thailand is insulated from national politics. A favorable relationship between resources and population makes Thailand a rich country. The rural population, numerically dominant, is a sturdy wet-rice farming peasantry. They live largely free from serious socio-economic

problems. Thai society is "loosely-structured" as a hierarchy of statuses rather than divided by class. The autonomous individual is the fundamental unit. Distinctions between town and country, and ethnic and occupational groups are important.

Between 1851 and 1925, Thailand successfully absorbed the blow of Western imperialism by a policy of concessions, internal reorganization, and national consolidation. In 1932 the monarchy, undermined by Western ideas, bureaucratic reforms, and economic difficulties was forced by a group of bureaucrats to accept a constitution. By 1938 the army had become the dominant group among the bureaucrats. After World War II the bureaucrats and politicians split into a number of cliques which contended for power. The army has remained on top.

The orderly transformation of institutions from a traditional magico-religious monarchy with elements of quasi-feudalism to a rationalized bureaucratic system was a success. But during the constitutional period there has been difficulty with novel ideas and institutions. Thailand has had three provisional and four "permanent" constitutions. The practice of factional constitutionalism -- the writing of constitutions to protect the position of a clique -- has resulted in a number of forms of national assembly. The assembly has never been able to exercise its constitutional authority over a strong, centralized bureaucracy. Whenever it has tried to do so it has been rebuffed or ignored.

The national assembly has functioned as a sounding board for a variety of ideas. Its members represent in themselves a number of kinds of people though there is little representation of broad interests. Political parties are personal cliques. They have taken two forms in the assembly -- the heterogeneous government groups and the more homogeneous opposition cliques. Elections have had little effect on national leadership although they are a device for legitimization.

The cabinet, as the institution which controls the bureaucracy, is the formal seat of the ruling group. Cabinet members have been mainly bureaucratic, either civil or military. Cabinet ministers tend to become representatives of agencies of the bureaucracy. The Premier has legal powers to control if he has requisite personal authority. It is difficult to generalize on the office of Premier because its history has been dominated by one man. Among agencies of the bureaucracy, the army has been most successful in dominating the political system because of advantages of force, organization, and attitude.

Behind the formal institutions is an informal structure of personal cliques. The strength and extent of such cliques depend on the personal qualities of their leaders. In association with periodic *coups d'etat* there have been more formal exclusive groups which claim the right to judge the propriety of the political situation and which are in fact the ruling groups. There has been a pattern of conflicts between alternative ruling groups at the root of which is a struggle for status. This struggle has been exacerbated by tensions between traditional and novel institutions and ideas. But basic stability continues.

Microfilm \$5.15; Xerox \$18.25. 401 pages.

POLITICAL SCIENCE, INTERNATIONAL LAW AND RELATIONS

FLUCTUATIONS IN THE PRESTIGE OF THE UNITED STATES IN FRANCE: A DESCRIPTION OF FRENCH ATTITUDES TOWARD THE UNITED STATES AND ITS POLICIES, 1945-1955.

(L. C. Card No. Mic 60-1131)

Mary Mayflower Benjamin, Ph.D.
Columbia University, 1959

This study is primarily concerned with the fluctuations of French public opinion as affected, among other things, by American foreign policies, the main objective being to trace the conditions that have increased or decreased the prestige of the United States in French eyes. After an introduction designed to explain our understanding of the meaning and the political significance of prestige, we indicate the method we follow and the character of our evidences. We then proceed to canvass year by year the findings of two French polling systems--the Institut Français d'opinion Publique and the Service des Bondages et Statistiques--on questions directly or indirectly relevant to Franco-American relations.

The first part concerns the changing French attitudes to the United States between 1945 and 1950. The second part, 1950-1955, carries on the study up to the end of the decade. For the later period, with the fuller development of the divisions of French post-war public opinion, additional evidence has been included in the form of a survey of the opinions of a representative list of French periodicals along the whole political spectrum from the Communist Left to the extreme Right.

A concluding section reviews the ten years' trends and offers a summation of the modes in which the policies and other activities of the United States during the period have tended to raise or depress American prestige in French eyes, as indicated by responses to these activities and by the image of America or the appraisal of the American way of life that is suggested by popular characterizations.

In brief, the evidences suggest that, while there was throughout a preponderance of favor for the United States as against the Soviet Union, American prestige was moving downwards during these ten years. At the close of the War the sense of America as the liberator of France tended to exalt the reputation of the United States. But some drift soon set in mainly because America's urge for security in the quick arising rift with the Soviet power ran athwart France's demand for both "coexistence" and security against the defeated Germany. By 1954, with the advent of Mendès-France to power, "la politique du oui," as submission to American policy was academically termed, was for the first time exposed to French challenge as shown in the defeat of the E.D.C. and the division over the cease-fire in Indo-China.

While numerous changes in post-war conditions and relationships affected French attitudes toward the United States the major favorable factors became on the one hand American economic aid and especially the Marshall Plan and on the other the recognition that the United States was much the strongest bulwark against Soviet threats and encroachments. The major unfavorable factors were, first, United States policy for the strengthening of post-War Germany, second, the development of what seemed to

the French the intransigent and too exclusively military policy adopted by the United States vis-à-vis Soviet Russia, and third, the traditional anti-colonialist attitude of the United States.

Of these three issues the question of Germany lost some of its early acuteness during the decade, as France became more reconciled to the policy of European economic and even military union. The second, however, the anti-communist strategy of the United States, caused the French to be rather increasingly restive, with their strong desire to find a *modus vivendi* with Soviet Russia along with their fear that heavy military expenditures would imperil their economic recovery. The third issue, that of colonialism, also increased in importance as the threat to French imperialism became aggravated. It was therefore these two latter issues which precipitated apprehensions with regard to American policy and accounted for the decline of American prestige. A broader apprehension was also sufficiently apparent, the sense of the new French dependence on American power and American policy, especially vexatious to a people convinced of their own cultural superiority and suffering from the sharp decline in their own world position.

In sum, our evidences support the conclusion that while the power-standing of a country is the basis of its international prestige, other factors play an important role. Most notably, any tendency on the part of the prestige-bearer in its foreign policy to show any lack of respect for the full sovereign claims of another country appears to be particularly detrimental to prestige.

Microfilm \$6.00; Xerox \$21.20. 470 pages.

UNITED STATES REFUGEE POLICY: 1789-1956.
A STUDY OF THE TRADITIONAL POLICY OF
ASYLUM FOR POLITICAL, RACIAL OR
RELIGIOUS REFUGEES.

(L. C. Card No. Mic 59-6338)

Harry Francis Mullaly, Ph.D.
New York University, 1959

Adviser: Dr. Louis W. Koenig

The implementation of the traditional United States policy of asylum for victims of religious, racial or political persecution has been seriously hampered since 1924 by the inflexibility of the immigration laws which have made no provision for its accommodation thereby creating a dilemma in foreign policy in which the professed ideals and objectives of the nation are frustrated by overriding domestic factors.

The purpose of this study was to evaluate this policy as a vital part of the nation's foreign policy in the ideological struggle against Communist world imperialism, and to determine a set of working principles for its future successful implementation. The Refugee Relief Act of 1953, as a recent policy program, was also analysed and evaluated on its accomplishments. The necessity for defining principles in view of the omnipresent refugee problem and the ever-growing one of world population growth and migration of peoples was emphasized.

The world refugee problem in its legal aspects of right

of asylum, protection, and statelessness, and its social aspects of reception, care, resettlement or integration within the complex network of immigration laws and diverse social and economic systems of free nations, is presented as a continuing challenge, given the present organization of international society, which the United States must meet with programs based on soundly conceived principles.

The origin and development of present policy was traced from American immigration history, and governmental documentation, the records of international conferences, the United Nations and other organizations. The policy statements of patriotic, veteran, labor, business, educational, religious and ethnic leaders or groups were also canvassed as was the press and periodicals at various junctures. Two questionnaires were utilized one addressed to the voluntary agencies aiding refugees, another to patriotic, veteran, labor and other organizations. Letters were addressed to the diplomatic representatives of governments affected by the Refugee Act. The comments of members of Congress concerned with refugee legislation were invited.

Four factors were found to have affected policy: economic, socio-cultural (racial), security (loyalty, nationalism), and foreign policy. Five principles were derived for the formulation and execution of policy: 1) adaptability to foreign policy requirements, 2) conformability to international law, commitments made by the United States or the purposes of international bodies of which it is a member, 3) flexibility of immigration controls to reflect changing needs of refugee policy, 4) insurability of the defense, economy and health of the nation and the equal treatment of refugees, and 5) practicability in administration by centralization of policy decision and operations in one agency, with dual functions within and without the nation, and provision for appeal from administrative decisions.

The effects of the four factors on policy were analysed in five periods from 1789 to 1956, and in the Refugee Act. The economic factor, unrestrictive while the nation was settled, later restrictive after industrialization, predominated during the first hundred years. In 1882, the socio-cultural factor appeared first as a racial bar to Asiatics, later by national differentiations through the literacy test device of the Act of 1917. No distinction was made between the immigrant and the refugee up to that time, and the refugee was exempted from most qualitative restrictions. World War I, the rise of nationalism and the fear of Communist or other subversions, paralleling European developments, introduced the security factor and advanced the socio-cultural to a preeminent position culminating in the Immigration Act of 1924, based on a theory for preserving the racial homogeneity of the nation. Paradoxically, these factors impelled foreign policy considerations by the United States to solve the refugee problem caused by the racial and nationalistic policies of the totalitarian regimes, despite internal isolationist and restrictive pressures.

The foreign policy factor emerged completely in World War II and after necessitating Executive policy programs such as the Refugee Relief Act of 1953, which synthesized all four factors and compromised them as its legislative history and administration revealed.

The study concludes that the most disturbing of the factors affecting past and present policy were the

socio-cultural one embodied in the Immigration and Nationality Act of 1952, and the security factor as so extremely applied in the Refugee Act of 1953, and that whether or not the present law is retained, amended or replaced, provision must be made for the application of the five principles suggested to accommodate the requirements of foreign policy. The study recommends a flexible percentage of annual quota admissions be set aside for the privilege of asylum, without distinction as to race, creed or national origin, with adequate safeguards for the national security, health and economy, preferences to unite families, acquire needed skills, or increase the nation's intellectual enrichment, and a single governmental agency for administration and continuous cooperation between the Congress and the Administration to achieve the national interest. Microfilm \$4.70; Xerox \$15.80. 367 pages.

OPEN DIPLOMACY AND REGISTRATION OF TREATIES

(L. C. Card No. Mic 59-6342)

Ali Sheikhislam, Ph.D.
New York University, 1959

Adviser: Professor Waldo Chamberlin

A characteristic of European diplomacy during the nineteenth and early twentieth century was widespread use and general acceptance of secret treaties as a legitimate, if not an essential, feature in international relations. Many of the most important treaties of alliances concluded at the turn of the century, as well as some agreements made between 1915 and 1916, were kept secret until the rapid events of World War I revealed them to the public. Several attempts were made by labor parties and liberal elements in Europe, especially in French and British parliaments, to do away with secret dealings by governments, but without success. From time to time efforts had been made by many scholars and l'Institut de Droit International to set up a union to publish international treaties on a global scale. The attempt failed because governments would not cooperate.

The publication of the secret treaties of the Allies in 1917-1918 helped turn the tide of public opinion against the practice of secret dealings in international relations. Liberal elements in several countries and the press of much of the world embarked on a campaign against secret agreements between governments. In 1918 Woodrow Wilson proclaimed what might be called the Magna Carta of modern international relations, "open covenants openly arrived at." He placed this concept in the forefront of his Fourteen Point program for peace, and it was welcomed by the public and the press. Allied leaders accepted the program as the basis for the peace settlements. The first of the Fourteen Points set forth a formula for "Open" or "New Diplomacy."

At the Paris Peace Conference of 1919, the doctrine of Open Diplomacy was incorporated in the preamble and Article 18 of the Covenant of the League of Nations. The accepted interpretation of the wording in the Covenant was that treaties should be published following negotiations, which could be open or secret, and that no peoples would

be obliged to commit themselves to any international undertaking concluded without their knowledge. The Covenant was the first international convention in history which pledged the signatories to the idea of Open Diplomacy. The provision for registration and publication of treaties would, it was hoped, thwart future attempts to conclude secret treaties.

In 1920 the registration and publication of treaties in accordance with Article 18 of the Covenant was an innovation in international law. The League had neither a precise interpretation of Article 18, nor experience in registering and publishing treaties, and for more than a quarter of a century the problem was studied by several organs and special committees. All these bodies unanimously held that the Article could usher in a new era in international relations. The representatives of several states, including those of great powers, believed that Article 18 signified the universal acceptance of the doctrine of Open Diplomacy. The organs and committees maintained also that Article 18 had a double sanction: one similar to other Articles of the Covenant, and another "over and above" the other Articles because treaties were without any binding force as long as they were not registered. This effect of registration was considered absolute and unconditional.

The treaty registry of the League was entrusted to the Legal Section, one of the largest single services of the Secretariat and from time to time included jurists of international reputation. The two major activities of the Legal Section were to promote the codification of international law, and supervise and encourage the registration of treaties.

The register gave notarization to the treaties registered. The parties to a treaty had to deposit with the Secretariat a textual, complete copy with all appurtenant declarations, protocols, ratifications and the like. The register was kept in chronological order, listing the parties to the instrument, its title, dates of signature, ratification, date of submission for registration and the registration number. Each text was marked *ne varietur* by the Secretary-General or his deputy. Apart from the chronological register, a second register was kept which formed to some extent an *état civil* of the instruments concerned. Certificates of registration were delivered to the parties concerned under the signature of the Secretary-General or one of his deputies.

The official texts of the instruments registered were published in full in the language presented to the Secretariat, with French and English translations if the original were in other languages. From 1920 to 1946 the League registered and published 4,834 international instruments.

The question of secret diplomacy was not an issue at the San Francisco Conference in 1945, but the drafters of the United Nations Charter maintained the necessity for inserting a provision similar to Article 18 of the Covenant. Article 102 of the Charter provides for registration and publication of treaties, but the sanction of absolute invalidity of unregistered treaties provided by Article 18 of the Covenant was confined in Article 102 to invalidity of unregistered treaties invoked before organs of the United Nations. In practice, however, the General Assembly of the United Nations passed several resolutions maintaining that the treaty registration was an absolute obligation for the members, regardless of whether invoked before organs of the United Nations or elsewhere.

Throughout the years the delegations of several states and the organs of the United Nations which worked for the implementation and interpretation of Article 102, declared their adherence to the principle of Open Diplomacy as it was outlined by the League of Nations. The registration of treaties by the Secretariat of the United Nations is a continuation of the League system with no change in principle.

The procedure for registration by the United Nations is basically similar to that of the League, with one notable exception. The exception is that in addition to registration, certain categories of treaties can be filed by the United Nations. This permits inter-governmental organizations to file their treaties and have them published by the Secretariat. The procedure for filing is similar to that of registration, but the word "filing" has not the legal connotation given to the word "registration" in Article 102.

In 1946 the Division of Immunities and Registration of Treaties was established, later to become the Treaty Section of the Office of Legal Affairs. The Section has three times as many staff members as its counterpart in the League. The United Nations has registered, filed and published in a decade more treaties than did the League of Nations in more than a quarter of a century.

In the thirty-seven years from July 5, 1920, to June 15, 1957, the Secretariats of the League and the United Nations registered 10,676 instruments and by August 19, 1957, had published 479 volumes of the *Treaty Series*.

The registration and publication of treaties by the League and the United Nations was a realization of the dream of generations of students of international law and political science. By the registration and publication system, the texts of treaties were made available throughout the world in a convenient linguistic and documentary form. A great advance has been made, not only toward Open Diplomacy, but also toward the development of international law. The world's treaty law has entered a new stage and the scientific study of the conventional law of nations has been greatly facilitated.

Microfilm \$3.20; Xerox \$11.00. 246 pages.

POLITICAL SCIENCE, PUBLIC ADMINISTRATION

ADMINISTRATIVE BEHAVIOR IN THE AIR MATERIEL COMMAND

(L. C. Card No. Mic 60-1185)

John Lewis Hess, Ph.D.
The Ohio State University, 1959

It was hypothesized that successful civilian administrators within a military-logistics organization (The Air Materiel Command of the United States Air Force) tend to conform to a behavioral stereotype postulated by the military officers managing the organization.

The hypothesis was tested by obtaining descriptions of supervisory behavior, utilizing the Leader Behavior Description Questionnaire (LBDQ) developed by the Personnel Research Board, the Ohio State University. The LBDQ

purports to measure two behavioral dimensions, Consideration and Initiating Structure. The former is considered to be indicative of human-relations-oriented (democratic) supervisory behavior, while the latter is equated generally to structuring (authoritarian) behavior.

Descriptions of an "ideal" military officer administrator were obtained from one hundred and nineteen general officers and colonels. Records of civilian administrators were reviewed and two hundred and sixty-five cases selected which could reasonably be dichotomized into "successful" and "less than successful" categories. Supervisors of the civilian administrators were asked to describe their subordinates, utilizing the LBDQ for the purpose. In addition, each of the supervisors was asked to describe an "ideal" subordinate.

All questionnaire responses were scored, with item scores combined into dimension scores. Means and standard deviations were computed for the individual questionnaire items and for the dimensions. Correlations were computed between questionnaire scores and selected biographical variables pertaining both to the describers and to those described.

Analysis of questionnaire responses indicated that an "ideal" behavioral stereotype did exist in the minds of the top-ranking Air Materiel Command military officers. Moreover, it was found that the successful civilian administrators conformed to the stereotype to a significantly greater extent than did the less than successful civilian administrators.

Both the "ideal" and the successful civilian groups scored significantly higher on the Consideration and Initiating Structure dimensions than did the less than successful civilian group. Furthermore, both the "ideal" and the successful groups showed a slight bias toward structuring behavior, while the less than successful group showed a similar bias toward considerate behavior.

Questionnaires (LBDQ's) were administered to a small sample (18) of successful administrators in two non-military federal organizations. Comparison of mean dimension scores of this group with those of the successful Air Materiel Command civilian group showed no significant differences. Comparisons with two other groups (aircraft commanders and school administrators), from a previous study reported by Halpin, produced significant differences with regard to dimension scores. Based on the latter data, it was considered that the Air Materiel Command environment produced a differential effect on administrative behavior, but, in view of the similarity of mean scores of successful administrators in the Command and in the non-military agencies, it was hypothesized that the bureaucratic vis à vis the military aspects of the environment produced the greater impact on administrative behavior.

Although the patterns of both "ideal" and real (successful) behaviors in the Air Materiel Command indicated a slight bias toward authoritarian as compared with democratic supervisory attitudes (assuming a degree of equivalence between Initiating Structure and "authoritarian" and between Consideration and "democratic"), no evidence was adduced which would denote that the behaviors valued and imitated were antithetical to liberal-democratic social values.

Finally, certain of the statistical correlations indicated significant relationships between selected biographical data (e.g., age and education), pertaining to both describers and those described, and the describers' perceptions of administrative behavior. Microfilm \$2.50; Xerox \$6.00. 124 pages.

PSYCHOLOGY

PSYCHOLOGY, GENERAL

THE PRIMARY DIMENSIONS OF ITEM RATINGS ON SCALES DESIGNED TO MEASURE 24 OF MURRAY'S MANIFEST NEEDS

(L. C. Card No. Mic 60-851)

Mary Marjorie Campbell, Ph.D.
University of Washington, 1959

Chairman: Dr. Paul Horst

This research was concerned with the determination of the basic traits--the dimensions--of personality as the essential preliminary step in the development of unidimensional personality scales. It was particularly designed to investigate the number and identity of the primary dimensions of one of the most comprehensive and widely used descriptive theories of personality, Murray's system of needs. Procedures for a modified multiple group technique of factoring a large number of items were developed in order to identify the items representing each of the dimensions isolated.

To implement this research 24 experimental scales, each consisting of 12 items, were constructed to measure 24 of Murray's manifest needs. Murray's definitions were followed in the preparation of the items; item content was restricted to statements of actual behavior. No attempt was made to minimize or measure the social desirability of the item statements. The final selection of items was made by eight judges rather than by the usual tests of homogeneity of item groups. Then 211 students at the University of Washington rated themselves twice on the 288 items; the two test administrations were approximately a week apart. Five rating categories were used; these ranged from "much more often than most people" to "much less often than most people."

The preliminary statistical analysis of the items and the scales provided the data for the factor analysis and an estimate of the stability of the ratings. The average test-retest reliability of the scales was .81, based on the z' transformation. This analysis revealed that, although the items were generally more related to their own scales than to other scales, the scales were neither highly homogeneous nor highly independent. Fewer than 24 dimensions were, therefore, expected to result from the factor analysis.

An indirect method requiring the scale factor loadings and the item-scale intercorrelations, rather than the item intercorrelations, was used to obtain the item factor loadings. The scale intercorrelation matrices for both administrations were factored by the principal axes method. Ten factors in the first administration and nine factors in the second administration accounted for the systematic variance. Because of the high similarity of the results for the two administrations, multiple group item factor loading vectors were computed for the first administration only. This item factor matrix was rotated to approximate simple structure by finding ten relatively independent,

factor-pure pivot items and by obtaining the correlations between the ten pivot items and the remaining 278 items.

Each primary dimension was described by the set of items whose largest factor loading was on that dimension. An attempt was made to hypothesize the personality trait which would relate the various aspects of behavior depicted in the items. The item descriptions of the first seven factors were sufficiently consistent to postulate seven personality traits. The last three factors were not as clearly defined; their identity was considered extremely tentative. The ten proposed dimensions were: Social Dependency, Expressive Aggressivity, Attention Seeking, Deferral Conformity, Meticulousness, Self-Conscious Intellectualism, Gregarious Exhibitionism, Personal Adequacy, Personal Responsibility, and Self-Depreciation. It was suggested that, if the arbitrary ordering of the dimensions corresponded with the variance contribution of each factor, the Social Dependency dimension may be a general factor related to social desirability and the last factor, the tentative Self-Depreciation dimension, may be relatively unimportant. A comparison between the groups of items defining the ten new dimensions and the groups of items in the original 24 scales indicated that the factor structure of most of the 24 original needs was complex.

The findings of this study do not necessarily reflect the dimensionality of Murray's needs since there was no attempt to validate the 24 original scales.

Microfilm \$2.65; Xerox \$9.25. 204 pages.

SEX-ROLE IDENTIFICATION AND ACHIEVEMENT MOTIVATION IN COLLEGE WOMEN

(L. C. Card No. Mic 60-1178)

Donald Stuart Dunbar, Ph.D.
The Ohio State University, 1959

The major purpose of the present study was to explore the general hypothesis that the sex of the thematic picture figure with which college women identify their achievement strivings can be predicted from a knowledge of the subjects' sex-role orientation. Two additional purposes of this study were (a) the selection of a set of male and female thematic pictures paired for equivalence of achievement cue value and (b) the construction and validation of a measure of sex-role identification.

The male and female thematic pictures were paired on an a priori basis for equivalence of achievement cue value. The success of this procedure is suggested by the fact that the hypothesis of no differences in group n Achievement scores to paired male and female pictures was rejected in only two out of twelve tests. One of these two exceptions was attributed to serial position effects; the other, to sample characteristics.

Theoretical considerations led to the construction of two measures of sex-role: (a) sex-role identification and

(b) sex-role preference. Differential relationships of these two measures to validity criteria suggested that the former was measuring an overt behavior variable; the latter, a fantasy variable. Internal consistency data and an examination of item content led to the conclusion that the sex-role identification measure included at least two types of items which may represent two relatively independent dimensions: sex-role identification and sex-role adoption. The former is presumably represented in items referring to early learning experiences relevant to sex-typing; the latter, in items referring to the subject's present interests and social behavior.

In a theoretical discussion an attempt was made to integrate with thematic apperception interpretation theory an identification theory, which assumes identification to be in large degree a function of the model's (perceived) ability to command goal states desired by the identificand. From this theoretical position several assumptions and general hypotheses were developed; from these, in turn, were formulated a number of research hypotheses predicting differences (or in some instances, no differences) between the quantity and validity of female subjects' achievement responses to career-male and (matched) career-female pictures.

The general hypothesis of a relationship between the subjects' sex-role orientation and their differential achievement imagery projections onto male and female pictures was firmly supported. Each of the two sex-role measures, however, seemed to be rather uniquely related to certain achievement response patterns. Generally, sex-role preference scores were more predictive of career-male picture responses; sex-role identification scores, of career-female picture responses. The latter relationship was a complex one, and occurred only for low ("feminine") sex-role identification scorers who were either (a) also career-oriented or (b) being tested under achievement-arousal conditions.

Microfilm \$2.50; Xerox \$6.40. 134 pages.

**COUNSELING PSYCHOLOGY AND ITS
INTER-DISCIPLINARY RELATIONSHIPS:
AN ANALYSIS OF THE MATRIX OF
PSYCHOLOGICAL COUNSELING WITH SPECIAL
REFERENCE TO ROMAN CATHOLIC STUDENT
PERSONNEL WORK.**

(L. C. Card No. Mic 60-1109)

John Mark Egan, Ph.D.

New York University, 1959

It has become increasingly evident from its development within the past ten years that the field of counseling psychology, as an applied field encompassing both an "art" and a "science," must find its fundamental orientational pattern in a matrix not only of general psychology but also of philosophy and theology.

An inter-disciplinary approach to the field is necessary and inevitable because:

(1) counseling psychology, centered as it is on man-in-operation, on his day-in, day-out confusions, conflicts, strivings, aspirations, and anxieties, is intimately concerned with problems of human values besides the dynamics of human behavior;

(2) the therapeutic relationship is a value-laden one and cannot be expected to possess the "value-free" objectivity of laboratory psychology, since, by and large, this relationship (in itself, as well as the psychologist's approach to it, and his goals and objectives) is determined by the psychologist's view of human nature;

(3) a view of man-in-the-human-condition sufficiently comprehensive for the field of counseling psychology can only be obtained from drawing on those three basic disciplines which are specifically concerned with man, with the human being considered as "personality," as "person," and as "transcendent being."

The field of counseling psychology as an area of confluence of these three disciplines may be more clearly realized from a critical analysis of their areas of overlap, areas of inter-dependency and of their hierarchical relationships as human knowledge; or, more specifically, from an analysis, firstly, of the view of human nature possible to each discipline through its distinct starting points, methods, and types of conclusions; secondly, in terms of human values, of the norms of human behavior derivable from philosophy and theology, particularly from their normative branches, ethics and moral theology; and, thirdly, of the principle of the unity of truth which logically must characterize inter-disciplinary relationships.

From the standpoint of Catholic student personnel work, there is a distinctive matrix within the fundamental orientational pattern of the Aristotelian-Thomistic philosophical tradition and the Catholic theological system. This distinctiveness is more clearly realized through comparison and contrast with the underlying assumptions of certain schools of psychology, especially the psychoanalytic formulation when it departs from its invaluable clinical insights into the domains of philosophy and theology.

Philosophically, there are fundamental implications for counseling psychology flowing from the "middle-ground" approach of this tradition, firstly, with regard to the extremes of determinism and "indeterminism," in that it sees human behavior as incapable of an ultimate mechanistic reducibility just as it regards the possession of free will as not precluding man's being "determined" appreciably by his learned reactions, heredity, non-conscious propensities, physiological condition, and life circumstances; and, secondly, the extremes of mechanistic materialism and idealism, in that man is seen as a psychosomatic unity possessed of specifically human characteristics.

Similarly, there are fundamental implications for counselor and counselee attitudes within the theological concept of man which sees him as possessed, firstly, of a dignity deriving from his status as a God-image and from participation in the divine life of grace, secondly, of a nature deprived but not depraved; and, thirdly, of a responsibility to achieve a harmony within himself and in relation to his fellow-man and to God. This harmony can be seen as related to the demands of conscience and of superego, the "release" of sacramental confession and of therapy, and to counselor acceptance and counselee self-acceptance in terms of the individual's supreme, eternal value in the eyes of God.

Microfilm \$4.30; Xerox \$15.10. 334 pages.

A STUDY OF REACTION TO FAILURE AS A FUNCTION OF EXPECTANCY FOR SUCCESS

(L. C. Card No. Mic 60-738)

LeRoy H. Ford, Jr., Ph.D.
The Ohio State University, 1959

The primary problem investigated in the dissertation was that of the relationship between reaction to failure and expectancy of success. A second problem studied was the relationship between reaction to failure and the reinforcement value of success. The experiment was conceptualized within the framework of Rotter's social learning theory of personality. Since failure is commonly considered a type of frustration, an attempt was made to relate the problem under consideration to the general literature on frustration. An analysis of the literature led to the conclusion that in many of its aspects, frustration might be more fruitfully construed as punishment rather than response-blocking or nonreward, and failure was therefore so conceptualized.

The procedure used in this experiment required S's (119 fifth grade boys) to push a plunger when signaled to do so by the sounding of a buzzer. The buzzer could mean either success or failure on a simple formboard test or it could have a neutral meaning, depending on the instructions given to S and the time when the buzzer sounded. The change in each of two measures, force of pushing (FP) and reaction time of pushing (RT), from a neutral condition to a failure condition was treated as a measure of reaction to failure.

The conditions of the experiment were such that the most likely immediate reaction to failure was some kind of defensive escape behavior, probably in large part cognitive in nature. It was assumed that such avoidant responses would be incompatible with plunger-pushing and tend to interfere with the response, thus affecting RT and FP. It was hypothesized, partly on the basis of theoretical considerations and partly on the basis of preliminary experimentation, that this reaction would result in an increase in RT and a decrease in FP. The results of the final experiment supported these hypotheses. It was assumed, therefore, that both the magnitude of increase in RT and of decrease in FP were indicators of the magnitude of reaction to failure.

It was hypothesized that the higher the expectancy of success, the greater the reaction to failure. S's initial expectancy was measured by the number of candy coins S bet on himself to pass the test. In addition, the success experiences of S's were experimentally manipulated to create two groups differing in expectancy of success. A second hypothesis was that the higher the reinforcement value (RV) of success, the greater the reaction to failure. RV was experimentally manipulated by instructions designed to attach greater or lesser importance to success on the test and thus to create two groups, differing in RV.

Six hypotheses were stated, in terms of the experimental operations, as follows: (1) number of coins bet is positively correlated with increase in RT, (2) number of coins bet is positively correlated with decrease in FP, (3) increase in RT is greater for the high expectancy group than for the low expectancy group, (4) decrease in FP is greater for the high expectancy group than for the low expectancy group, (5) increase in RT is greater for the high RV group than for the low RV group, and (6) de-

crease in FP is greater for the high RV group than for the low RV group.

Hypotheses (1), (3) and (5), involving the RT measure, were supported. Hypothesis (4) was supported, but the other two hypotheses involving the FP measure were not supported. It was concluded that reaction to failure is a function of expectancy of success and the reinforcement value of success, at least under certain conditions, and that these variables merit further study.

Microfilm \$2.50; Xerox \$6.40. 133 pages.

THE PRESTIGE HIERARCHY AMONG OCCUPATIONS IN PSYCHOLOGY

(L. C. Card No. Mic 60-967)

Stephen G. Granger, Ph.D.
University of Minnesota, 1958

This study was undertaken for three reasons: first, to determine whether psychologists perceive a prestige hierarchy within their own occupational family; second, to discover whether differences in perception of this hierarchy could be found among special interest groups within the field; third, to describe some of the prestige differences existing within the family of psychological occupations in the hope that the knowledge of their existence would help neutralize their deleterious effects upon rational vocational choice, job satisfaction, turnover, and intra-professional relationships.

A questionnaire was constructed which contained an alphabetical list of 20 psychological job titles, selected as representative of the wide range of occupations in the field. Each title was accompanied by an abbreviated description of the job duties and the minimum academic degree likely to be possessed by those holding that job.

The list, with instructions to rank "according to your perception of their occupational prestige," was mailed to 1348 members of the American Psychological Association. The subjects included an APA random sample of 300, as well as 100 each of Clinical Diplomates, Counseling Diplomates, Industrial Diplomates, Fellows, and Associates from each of the Divisions of Experimental, Developmental, and Personality and Social Psychology, and 48 Fellows and 100 Associates from the Division of School Psychologists. The original and two follow-up mailings yielded a gross total return of 91.9% with a usable return of 87.3%.

Analysis of the usable return yielded the following results and conclusions:

1) Evidence for the existence of a measurable prestige hierarchy among psychological occupations as perceived by members of the profession was found in the indices of inter-individual and inter-group agreement. Statistically significant inter-individual agreement (coefficients of concordance ranging from .55 to .81) in ranking this hierarchy was found among subjects within all 12 subsamples. A conservative interpretation of the magnitude of the intercorrelations between the pooled rankings of the 12 subsamples (ranging from .84 to .99) led to the conclusion that

between-group differences in the perception of this hierarchy were essentially insignificant.

2) The hierarchy itself was outlined as follows: Professor of Psychology, Large University was accorded highest status with a unanimity of agreement which set it distinctly above all other occupations. Experimental Psychologist, General; Clinical Psychologist, Institutional; Social Psychologist, and Consulting Psychologist, Industrial were consistently granted high occupational prestige. Research Psychologist, Human Engineering; Counseling Psychologist; Research Psychologist, Test Construction; Psychologist, Survey Research; Clinical Psychologist, Private Practice; Professor of Psychology, Small Arts College; Child Psychologist, and Professor of Psychology, Teachers College clustered toward the center of the hypothetical prestige hierarchy, showing moderate prestige value. School Psychologist; Psychologist, Educational Skills Clinic, and Personnel Psychologist consistently formed a cluster which was set clearly below the moderate prestige group. Rehabilitation Counselor was accorded still lower status than the triad of low prestige psychologists. High School Counselor and Psychometrist formed a duo set distinctly below Rehabilitation Counselor and distinctly above Employment Interviewer, the title of least prestige.

3) The hierarchy was markedly affected by the stated minimum educational requirement. Among psychologists, academic degree appears to be an important determiner of occupational prestige.

4) Although indices of agreement were high, subtle between-group differences in ranking occurred. First each subgroup showed a tendency to inflate the status of those occupations allied with its own area of specialization. Second, the Experimental Fellows and Associates, Industrial Diplomates, and Developmental and Social Fellows upgraded the academic-scientific and research occupations. Third, the School Fellows and Associates, Developmental and Social Associates, and, to a lesser extent, Clinical and Counseling Diplomates tended to inflate the status of the service-oriented occupations.

Microfilm \$2.50; Xerox \$8.60. 190 pages.

A FACTORIAL STUDY OF RESEARCH POTENTIAL IN CHEMISTRY

(L. C. Card No. Mic 60-1184)

David Ovenden Herman, Ph.D.
The Ohio State University, 1959

The subject of this study is the nature of potential for research careers in chemistry. Research potential was explored by examining the common faculty model of the ingredients of professional promise. The subjects involved were doctoral candidates in chemistry.

Members of the chemistry faculties were interviewed to elicit descriptions both of promising and unpromising doctoral students. Individual descriptive phrases were lifted, usually verbatim, from interview transcripts, and placed on a rating check list. Each subject was rated on this check list by his adviser, who indicated the appropriateness of each phrase to the student in question.

A second questionnaire was constructed for self-

evaluation by the subjects. It was based on material from the interviews and from the literature on research ability. It included some biographical items, and attempted to tap attitudes toward laboratory and library work, as well as job orientations. The subjects filled out these questionnaires, and also completed Cattell's Sixteen Personality Factor Questionnaire.

The total of 201 rating items, test scores, and graduate point-hour ratios were then factor analyzed by the Wherry-Winer technique. Sixteen orthogonal factors were isolated, and fifteen of them proved to be interpretable. These factors, then, define a set of dimensions along which the behavior and attitudes of graduate chemistry students are seen to vary.

Included among the faculty ratings were separate predictions of four aspects of future research performance: productivity (or volume of output), originality, quality (or importance of the research findings), and whether the student would tend to enter pure or applied research. The factorial composition of these items yields a picture of the behavioral correlates of research promise, as seen by the faculty. The patterns of factor loadings for these four items were mutually distinct, indicating that the faculty was actually describing different aspects of research potential. The item communalities were fairly high, indicating substantial agreement among the faculty regarding the meaning of these four aspects.

The need for validation of the factors against a later criterion of productivity was recognized, as was the necessity of verifying the factor structure over another, and a larger, sample. Possible uses of the factors in guidance were discussed, and plans were outlined for a further project directed toward discovering differences between students entering the various areas within the general field of chemistry.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

DRIVE TRANSFER IN SECONDARY REINFORCEMENT

(L. C. Card No. Mic 60-681)

Frank Bucha Martin Jr., Ph.D.
University of Kentucky, 1953

Supervisor: James S. Calvin

Many experiments in learning have shown that when an organism emits a response in the presence of a stimulus, and this stimulus diminishes a need, then on subsequent, similar occasions there will be a tendency for the same reaction to take place. When an animal finds food in a maze in order to reduce the hunger drive, this is called "primary reinforcement."

A number of investigators have found that stimulus cues which have been repeatedly present when primary reinforcement has occurred tend to acquire rewarding properties themselves. These stimulus cues have been called "secondary rewards."

There is considerable evidence that for learning to occur, the reward need not be a primary one. A secondary reward can also serve as a basis for learning. However, there are still many questions about the effect of a secondary reward upon learning that remain unanswered.

It was the purpose of this study to investigate the effect of secondary reward upon learning when the drive conditions under which it was originally established were changed.

Four groups of rats were given 25 primary reinforced trials and 14 non-reinforced trials on a straight runway with a white or black goal box. The box was always the same for a given animal. All groups were then given 15 trials on a single choice U-maze. The groups consisted of: (1) ten rats who were under food deprivation on the straight runway and on the U-maze, (2) eighteen rats who were under food deprivation on the straight runway and a pain drive on the U-maze, (3) nineteen rats who were under food deprivation on the straight runway and thirst deprivation on the U-maze, and (4) ten rats who were under thirst deprivation on the straight runway and food deprivation on the U-maze.

For learning on the U-maze under conditions of secondary reinforcement the hunger-hunger group showed the only significant number of correct responses. The hunger-thirst and hunger-pain groups also performed at slightly better than chance level, but these differences were not statistically significant. The thirst-hunger group also performed better than chance level and this difference approached, but did not attain the probability levels conventionally accepted.

Conclusions.--1. A secondary reinforcer will operate effectively provided the drive remains the same as when the secondary reinforcer was established.

2. When a secondary reinforcer is established under a hunger drive and the drive is changed in a new learning situation, the effect of the secondary reinforcer is slight and only temporary.

Microfilm \$2.50; Xerox \$3.00. 55 pages.

LECTURE LISTENING SKILLS: THEIR NATURE AND RELATION TO ACHIEVEMENT.

(L. C. Card No. Mic 60-1209)

George Walter Rogers, Ph.D.
The Ohio State University, 1959

Individuals spend about one-half their communicating time listening. Lectures are listened to so that the listener may (1) gain factual information, (2) augment learning gained by other learning methods, (3) provide perspectives for learning gained by other learning methods, (4) be stimulated to learn from lectures or other methods, and (5) change his attitudes and opinions (not always in expected directions). Lectures are becoming increasingly important in an America characterized by expanding college enrollments. Thus the nature of lecture listening deserves study, as does the relation of lecture listening and academic achievement.

A review of related research indicated that much of a non-specific nature has been written on listening. Particular difficulty arises when attempts are made to generalize to lecture listening achievement findings obtained by diverse listening criteria. Major areas inadequately investigated in previous studies include definition of lecture listening and investigation of lecture listening and achievement.

The problem of this study is twofold: to investigate (1) the nature of lecture listening skills and (2) the relation of lecture listening skills to lecture listening and to general academic achievement.

A sample of 149 students in eight sections of a how-to-study course at the Ohio State University was reduced because of partially missing data to a usable sample of 113 Ss. The procedure consisted of administering several measures on four days. On one day Ss expressed their interest in 10 potential lecture topics. Ten days later Ss observed a filmed lecture, took notes, and observed a rerun of the film, with stops at critical spots to sample Ss' reported thoughts at those points during the first film showing. The last device is termed Stimulated Recall. Next day Ss completed the lecture comprehension measures (consisting of fact and principle, application, and detail) and five attitude scales. On the final day, Ss were given a listening comprehension test, including measures of immediate recall, following directions, recognizing transitions, recognizing word meanings, and lecture comprehension. Academic achievement was measured by one quarter's grades.

Results

The sample characteristics indicate that generalization from the findings should be made cautiously. Verbal ability was found to be related to several skills used as predictors, a development not unexpected because of the verbal nature of the skill measures.

A factor analysis indicated adequate support for a General Listening Ability factor and a factor, called Self-reliance, that refers to a tendency to think independently and to avoid passive satisfaction with the filmed lecture and associated activities. Less well supported were factors of Recall, Academic Conformity, and Passive Participation.

College enrollment, age, and sex were not significantly related to lecture listening achievement. Lecture achievement, in turn, was slightly (but non-significantly) related to the tendency to sit in the front and center of the lecture room, instead of at the rear and sides. The most nearly unique variable, Stimulated Recall, was among the skills moderately related to both lecture listening and academic achievement.

The use of electronic computing devices permitted investigation of the effects of using all 16 listening skill measures in the prediction of lecture listening and academic achievement. The multiple correlation coefficients between all 16 predictors and the three lecture listening criteria ranged from .604 to .817, and for academic achievement, .670. The latter figure represents an improvement from the Pearson correlation coefficient of .38 between academic achievement and the best single predictor, verbal ability.

Lecture listening skills, although relatively unrelated to each other, were related to both lecture listening and academic achievement. Several suggestions were included for further research. Of immediate interest is the usefulness of the five factors in predicting achievement.

Microfilm \$2.65; Xerox \$9.25. 204 pages.

THE EFFECT OF LEARNING DISTINCTIVE
RESPONSES TO VISUAL STIMULI ON THE
ACCURACY OF THEIR DISCRIMINATION

(L. C. Card No. Mic 60-874)

William Turner Stellwagen, Ph.D.
University of Washington, 1959

Chairman: B. B. McKeever

This study dealt with the question whether the learning of a specified distinctive response to a visual cue increases a S's accuracy in discriminating this cue from another when both are presented near the threshold for discrimination. The distinctive learned responses were of two classes, verbal and proprioceptive. The visual cues were ink blots. Two related experimental designs were used, one using nonsense labels and one using motor responses. The procedure consisted of three phases for both experiments, pretest, training, and posttest. The pretest consisted of tachistoscopic presentation of pairs of visual cues in order to obtain crude estimates of discrimination thresholds. At the conclusion of the pretest, the training trials were administered. During training each S was presented with the cues labeled in different ways. For some of the pretest pairs, each member of the pair was labeled distinctively. For other pairs, each member of the pair was labeled identically. After learning to a criterion of three successive perfect trials, a posttest was administered. The posttest consisted of trials aimed at the re-determination of accuracy in discriminating the pairs of visual cues presented in the pretest. The posttest permitted observation of any differential change in accuracy under the different labeling conditions.

The general procedure for the second experiment was very similar to that of the first. A pretest was administered following by training which, in turn was followed by a posttest. The pretest and posttest were aimed at the determination and re-determination of discrimination accuracy for pairs of visual cues. During training, the cues were associated with English phrases such as "raise up" or "press down." The Ss were instructed to make an appropriate motor response to these cues. The motor response was pressing buttons with the hands or pressing buttons with the feet. Two visual cues were associated with phrases which presumably did not produce a "set" to make any distinctive motor response. Pretest and posttest comparisons were possible for pairs of cues, each member of which had been associated with distinctive or non-distinctive motor responses, respectively.

The data suggest the conclusion that learning a distinctive response, either verbal or motor may enable a S to discriminate visual cues more accurately under certain conditions of presentation. This increase in accuracy seems dependent upon whether the cues are presented under simultaneous or successive conditions. If the required responses were verbal, there was a differential increase in accuracy when the cues were discriminated successively. If the responses were proprioceptive, there was a differential increase in accuracy when the stimuli were discriminated simultaneously.

The results of the two experiments were evaluated as they relate to what has been called the "Whorfian hypothesis," and to relevant discussions of the "acquired distinctiveness of cues."

Microfilm \$2.50; Xerox \$4.00. 73 pages.

A COMPARISON OF THE STRONG
VIB PROFILES OF HIGH ABILITY MALE S.L.A.
FRESHMEN WHO CHANGE EXPRESSED
VOCATIONAL CHOICE WITH THOSE
WHO DO NOT CHANGE SUCH EXPRESSIONS

(L. C. Card No. Mic 60-949)

Richard Ryle Stephenson, Ph.D.
University of Minnesota, 1959

Problem: To determine the efficacy of the Strong Vocational Interest Blank for Men (SVIB) in predicting the registration behavior of high ability, male, liberal arts college, freshmen; to determine if these freshmen students are registering in curricula consonant with their inventoried vocational interests, and; to supply normative data for this group.

Sample: 133 male matriculants in the Fall Quarter, 1958, in the University of Minnesota's College of Science, Literature, and the Arts. These include 92 per cent of the top 10 per cent of the entire male class on a combined measure of scholastic aptitude and high school achievement.

Design: SVIB profiles, as a measure of inventoried vocational interests, were compared with college major registered for, a measure of manifest vocational interests. The first two registration periods, Fall Quarter, 1958, and Winter Quarter, 1959, were investigated. The possible registration alternatives at the first period were to Choose a major or to be Undecided, and, at the second period, to Remain with the first declaration or to Change intentions, which for first registration Undecideds is to Choose. Thus there are four registration sub-groups as follows: Choose-Remain; Choose-Change; Undecided-Remain; Undecided-Choose.

Major Findings: The major research hypotheses tested were as follows (whether the hypothesis was accepted or rejected is indicated in parentheses):

- There are no differences in numbers of Primary, Secondary, or Reject interest patterns between members of the Choice and the Undecided groups (Accept).
- Members of the Choose-Remain sub-group have a single Primary interest pattern (Reject) and have registered for a goal consonant with the Primary interest pattern (Reject).
- Members of the Choose-Change sub-group have initially registered for a goal not consonant with a Primary interest pattern (Accept) but change to a goal consonant with one (Reject).
- Members of the Undecided-Remain sub-group have no Primary interest patterns (Reject).
- Members of the Undecided-Choose sub-group have Multiple Primary interest patterns (Reject) and at the second registration period select a goal consonant with one of these Primaries (Reject).

Minor Findings:

- The null hypothesis is rejected when the four

sub-groups are compared on the non-occupational scales of the SVIB.

b. Non-occupational scale findings reverse themselves when tested on a sample of 106 Fall Quarter, 1957, matriculants, selected as a cross-validation group.

c. More persons obtain SVIB scores in the "chance" range than in any single letter grade classification.

d. Approximately one-half of the 1958 sample are not pursuing curricula consonant with either SVIB Primary interest patterns or with SVIB "A" letter grades on occupational scales. The one-half who are, are randomly distributed over the four registration sub-groups.

e. Normative data for SVIB interest patterns and SVIB letter grades are supplied for the total group of 239 high ability male freshmen.

Conclusions:

a. Since the design is such as to make expressed or claimed vocational choice synonymous with manifest vocational choice, and since the SVIB is a valid indicator of inventoried vocational choice, it was concluded that in only about one-half of the cases was there consonance among all three for this high ability group.

b. In only a very general sense (the one-half proportion) does the SVIB predict registration behavior for this group, and in no case differentially by manifest choice.

c. It appeared that the guidance workers concerned were not utilizing to the fullest advantage the known validity of the SVIB. Further research is necessary to verify or to refute this assumption.

Microfilm \$2.55; Xerox \$9.00. 196 pages.

THE EFFECT OF SCHOOL DEPARTMENTALIZATION ON THE ORGANIZATION OF CERTAIN MENTAL ABILITIES

(L. C. Card No. Mic 60-708)

Thomas Estill Sutherland, Ph.D.
University of Kentucky, 1954

Supervisor: Dr. Lysle W. Croft

Garrett, in 1946, proposed the "developmental theory." He also suggested at that time that there may be an environmental effect on mental organization. This study was designed to test the effect on mental organization of the type of training which the student receives in the schools. The training studied was of two types: departmentalized and non-departmentalized. Departmentalized training is that in which a separate teacher is used to teach each subject, while non-departmentalized training is that in which a single teacher is used to teach all subjects to a group of students. A further refinement of the non-departmentalized type of training is that in which the "core curriculum" is used. A distinguishing characteristic of the core curriculum is that in which the teacher attempts

to show the interrelationships among the various subjects taught.

Four school systems, which lie within a twenty-mile radius of Lexington, Kentucky, and which begin departmentalization at different grade levels, were chosen for the study. In all, 2,263 students were administered the SRA Primary Mental Abilities Test, Intermediate Level. Of this number, 1,838 students enrolled in grades six through ten were used. The students were divided into groups according to the school they were attending, and the groups were matched for age and total raw score on the test.

Correlations were computed among the verbal, numerical and spatial subtests for each group separately, and for all groups combined. The data were regrouped according to age only, and correlations were again computed among these subtests. A factor analysis was performed on the data to determine the communality shown at each grade and age level.

The results indicate that there may be an environmental effect on mental organization. The correlation between the verbal and numerical subtests showed a significant decrease approximately two or three years following the occurrence of departmentalization.

The verbal-spatial and the numerical-spatial correlations showed no consistent trend as far as departmentalization is concerned. A possible explanation of this is that spatial factors are not as closely related to school subjects as are the verbal and numerical factors. Hence, the departmentalization variable might not have as much influence or relative ranking in the spatial factor as it does on the ranking in the verbal and numerical factors. This explanation is purely speculative and is not supported by the data in the present study.

The results do not indicate that there is an increasing differentiation in mental organization with maturation per se. The variations in the correlations, when the data are grouped according to age alone, could have resulted from random fluctuations in a common population.

Factor analysis indicated that the average amount of variance accounted for by the general factor follow the same trend as the correlations between the verbal and numerical subtests.

No significant difference was found between the correlations among the verbal, numerical, and spatial subtests for the "core" group versus the "non-core" group. Apparently this difference in the type of training does not affect mental organization. Possible reasons for the finding of no difference are discussed.

The following conclusions are made:

1. The theory that mental organization changed with maturation per se is not supported. No significant change was found in any of the correlations with an increase in age.
2. The verbal-numerical correlation shows some tendency to decrease at a point two or three years following the occurrence of departmentalization.
3. The verbal-spatial correlations show no significant variation over the grade span studied.
4. Assuming one correlation to be irregular, the numerical-spatial correlations also show no significant variation over the grade span studied.

Microfilm \$2.50; Xerox \$3.00. 46 pages.

PSYCHOLOGY, CLINICAL

THE RELATIONSHIP OF DURATION OF
BIRTH TO CHILDHOOD ANXIETIES AS REFLECTED
IN THE RORSCHACH TEST

(L. C. Card No. Mic 60-633)

Byron Jackson Bolin, Ph.D.
University of Kentucky, 1950

The present paper provides (1) a review of the pertinent empirical or experimental studies on birth trauma (not dealt with here), (2) a review of major studies relating to the sensori-motor-neurological state of the foetus, (3) a report of an original investigation which attempts to provide data bearing directly upon the question of birth trauma, and (4) a somewhat detailed review of the psycho-analytic literature on the trauma of birth.

Neurological studies pointing to the impossibility of foetal reception and retention of neural impressions, with subsequent determining effects, should be the signal to cut short an investigation such as we had planned. However, very briefly, the findings seem to indicate at least the possibility that sensory impressions at birth may leave some kind of central record at a spinal, a thalamic, or a cortical level, or in some combination of these. Not only is the grey substance arranged in what is essentially the permanent form, but myelinization (which is not an essential corollary of function) is also sufficiently advanced to permit a good deal of well organized neural activity; and there is the possibility of some kind of cortical participation, possibly as a passive repository of foetal experience. In addition, there are the studies reporting the considerable activity and responsiveness, including the establishment of conditioned reflexes, in the foetus in utero and when removed from the uterus. Examination of the authoritative studies produced no evidence pointing to the absolute impossibility of lasting neural impressions established at birth or before, and considerable evidence suggesting the possibility of such impressions.

Access to a physician's records permitted us to select pairs of subjects who were similar in many respects but very different as to the length of labor. It was possible to draw subjects from a population of remarkable geographical, cultural, and socio-economic homogeneity. Children between the inclusive ages of 7 and 12 were chosen because of theoretical and practical reasons. Subjects constituting the experimental (long birth-time) and control (short birth-time) groups were matched and the group equated satisfactorily (statistically) as to sex, sibling position, apparent economic status, age, school grade, and mother's age at birth. Medical information permitted exclusion of most pathological conditions, including deep anaesthesia, at birth.

Tests and observations yielded the following statistically significant differences: (1) The mothers reported many more nervous children among the group whose labor-time was long. (Differences between the proportions of self-judged "nervous" mothers yielded insignificant t-ratios.) (2) Children of long birth-time exhibited more of the kinds of behavior usually considered neurotic, while the short birth-time subjects could more often be described by items signifying healthy, outgoing behavior. The Rorschach study revealed these statistically significant differences in the group of children of longer birth-

time: (1) more human movement responses; (2) fewer popular associations; (3) a lower proportion of animal responses; (4) more pure color responses; (5) more responses using light as a determinant, with significantly greater Y and V sums; and (6) more vague form responses as represented by the content categories of cloud-smoke, landscape, and geography. A few other Rorschach differences yielded t-ratios sufficiently high to be of suggestive significance and of use in rounding out the collective gestalten for the purposes of interpretation of probable personality trends.

On the basis of statistically significant findings, we conclude that (1) in our groups, children whose duration of labor was long exhibit more of the commonly accepted signs of anxiety, neurotic tendency, and relative emotional immaturity than otherwise comparable children whose birth-time was short; (2) that these differences cannot reasonably be attributed to impaired intelligence or apparent inequalities in the groups; and (3) that these differences are in some connected with the duration of labor.

Microfilm \$2.50; Xerox \$7.00. 150 pages.

THE RELATIONSHIP BETWEEN ADAPTATION TO
THORACIC SURGERY AND CERTAIN PRIMARY TEST
FACTORS IN PULMONARY TUBERCULOSIS PATIENTS

(L. C. Card No. Mic 59-6668)

Leon Cohen, Ph.D.
New York University, 1957

Adviser: Thomas N. Jenkins

1. The purpose of this study was to investigate the nature of changes in primary personality trait scores, measures of intellectual functioning, and a psychophysiological measure (Flicker Fusion Threshold) in a group of male pulmonary tuberculosis patients following extirpative thoracic surgery. The major theoretical hypothesis was that individual changes on the A primary traits described by Jenkins are statistically uncorrelated with changes in C primary traits. This hypothesis was proposed as an extension of the Neutral Theory of Personality formulated by Jenkins which holds that personality trait factors contain communal variances which comprise two independent basic factors or superfactors.
2. The specific hypotheses of the study stated that:
 - a. there would be significant decreases in scores on the A primary factors following thoracic surgery;
 - b. there would be no significant changes in scores on the C primary traits after surgery;
 - c. there would be no significant relationship between changes in scores on the A traits and changes in scores on the C traits;
 - d. Interest Masculinity score on the Jenkins B2 would be significantly increased following surgery;

- e. there would be significant increases in the mean FFT after surgery;
- f. there would be a significant decrease in intra-individual variability on FFT following surgery;
- g. scores on the WAIS subtests Picture Arrangement and Digit Symbol would be significantly elevated following surgery;
- h. no significant changes in subtest scores Vocabulary or Picture Completion were predicted;
- i. no statistically significant changes were predicted for a non-surgical population of tuberculous patients on any of the research measures.

3. Two groups of subjects participated in the study:

- a. A surgical group (N equals 42) which was examined with the research measures within two weeks prior to surgery and within five and one-half weeks post operatively.
- b. A non-surgical group (N equals 55) which was examined twice within a seven-week period.

All subjects were:

- a. males, between the ages of twenty and forty;
- b. first continuous hospitalizations for the diagnosis of pulmonary tuberculosis;
- c. in Activity Levels II and III (for the West Haven population Class W);
- d. seen initially at a period when they had been hospitalized not less than two nor more than twelve months. These groups were culled from a variety of Veterans Administration Hospitals and from a non-VA hospital.

4. The tasks presented to the subjects included:

- a. the filling out of answer sheets to items on the inventories entitled "How Well Do You Know Yourself?" and "How Well Do You Know Your Interests and Aversions?";
- b. responding to the flickering light source (strobatac) to determine the threshold of flicker fusion;
- c. responses to subtests Vocabulary, Picture Arrangement, Picture Completion, and Digit Symbol on the Wechsler Adult Intelligence Scale.

5. The results of this study were:

- a. All but the fourth A trait (lethargy) showed significant decreases following thoracic surgery.
- b. None of the five C traits showed statistically significant increases.
- c. Significant increases in scores on three A traits and significant decreases in scores on two C traits were noted within the non-surgical population.
- d. Three statistically significant correlations of changes of A and C traits were obtained within

both groups. In the case of the surgical group, there appeared to be an inverse relationship between changes on A6 (social insecurity) and C2 (emotional spontaneity) and a positive relationship between changes in C5 (rhythymia) on the one hand and changes in A3 (depression) and A10 (face-to-face shyness) on the other. In the case of the non-surgical sample of patients, statistically significant negative correlations were obtained between changes in C1 (buoyancy) and changes in A7 (self-commiserative autisms) and A11 (guilt), and between changes in A10 (face-to-face shyness) and C3 (organizing initiative). The above noted correlations were the only ones of a sample of 110 which proved statistically significant.

- e. No significant changes in scores on Interest Masculinity were obtained for either group of patients.
- f. The mean Flicker Fusion Threshold increased significantly following thoracic surgery.
- g. No changes were obtained in either the surgical or non-surgical patients with respect to intra-individual variability on FFT.
- h. Statistically significant increases on the Digit Symbol subtest of the WAIS were obtained for both groups. The increase of the surgical sample was considerably greater than that of the non-surgical patients.
- i. No significant changes in scores on subtest Vocabulary, Picture Arrangement, or Picture Completion were obtained by either group of patients.

6. The theoretical conclusion to be drawn from the results under the limiting conditions of the study support the independence of the A traits from the C traits. The results suggest that an alteration of one syndrome of behavioral potentials may occur independently of the other syndrome.

7. Several practical conclusions were suggested by the obtained results:

- a. Indeterminate chronic hospitalization with no apparent change in therapeutic regimen tends to increase potentials to react with feelings of depression, shyness, and self-pity, and to decrease potentials of reacting buoyantly or with emotional spontaneity. The need for further research to devise techniques of curtailing hospitalization is thus re-emphasized.
- b. Following thoracic surgical intervention there are significant decreases in traits commonly regarded as psychopathological. This suggests that where the patient's physical condition warrants, excusive surgery for the removal of residual cavities is followed by beneficial psychological changes.

Microfilm \$2.50; Xerox \$5.20. 104 pages.

AN INVESTIGATION OF SOME ASPECTS OF THE SZONDI TEST

(L. C. Card No. Mic 60-651)

Louis Feigenbaum, Ph.D.
University of Kentucky, 1951

This study is essentially an attempt to determine the existence of relationships between forty-one measurable Szondi variables and some other dimensions of behavior which are considered clinically meaningful. The forty-one Szondi variables were derived from the scoring profile and consisted of the following: number of "liked" choices for each of the eight factors; number of "disliked" choices for each of the eight factors; the mode for each of the eight factors; presence or absence of loadedness within each of the eight factors; total number of open reactions; total number of ambivalent reactions; presence or absence of any of the six most frequent vectorial constellations; and presence or absence of a particular configuration related to repression.

The other dimensions of behavior were derived from additional test results, case history data, and diagnostic classification. The following areas of behavioral functioning were delineated from the non-Szondi material being investigated:

1. Personality functioning as reflected in twenty-seven measurements found in Rorschach performance.
2. Intellectual functioning as indicated by the full scale quotient obtained of the Wechsler-Bellevue Intelligence test. Additionally, a comparison between verbal and performance scores was utilized.
3. The factor of age.
4. The factor of education.
5. The diagnostic classifications which included major groups of schizophrenics, neurotics, character disorders, and organic conditions. Additional groups consisted of paranoid schizophrenics, anxiety neurotics, alcoholics, depressives, and psychotics.

The subjects used in this study were 190 randomly selected males who were hospitalized for neuropsychiatric treatment at the Veterans Administration Hospital, Lexington, Kentucky. From each of these subjects there was obtained a single Szondi test in accordance with the instructions presented in "Introduction to the Szondi Test" by Susan Deri. In addition to this, 120 of these patients were administered the Rorschach Test; Wechsler-Bellevue tests were taken by 120 of the subjects; age data were available for 184 subjects; educational level was established for 183 subjects; official hospital diagnostic classification was available for each of the 190 patients.

For the purpose of evaluating the predictive ability afforded by the Szondi test, the "objectively-related" pairs were utilized to elicit predictive judgments from Susan Deri as well as a group of clinical psychologists. (Groupings were formed for each variable and these were compared for differential functioning with regard to any of the forty-one Szondi variables. Using the chi-square test of independence, significant differences were established. These were termed tentative "objectively-related" pairs.)

For Deri's predictions, each of the pairs was presented in a form that enabled the predictor to associate the specific Szondi reaction with either one of the two groups based on the non-Szondi variable. Due to the lack of familiarity with the Beck scoring system for the Rorschach test, and because of specific objections to the form of the material presented, Deri offered predictive judgments for thirty-nine of the ninety-five pairs. Of these thirty-one were in agreement with the objective findings and eight were in disagreement. Statistical analysis indicated that this achievement was significantly different from chance expectancy. The level of significance led to the rejection of the null hypothesis in favor of the conclusion that knowledge of Deri's theoretical formulations, regarding the meaning of the Szondi variables, aided in the prediction of the relationships found among the "objectively-related" pairs.

To determine whether the material presented in Deri's manual would also lead to increased predictive ability, five clinical psychologists were asked to make predictive judgments. Each one of the five individuals achieved successful agreement with our findings at a level that might have occurred purely by chance in less than one out of one hundred trials. This appears to indicate that the theoretical formulations offered in Deri's manual aid experienced clinicians to predict the relationships found among the "objectively-related" pairs.

The unanimity of success which was demonstrated by these five clinicians raised the question of a possible bias inherent to the form of the predictive procedure. To evaluate this possibility, seven clinical psychologists, having less experience and familiarity with Rorschach and psychoanalytic theories, were asked to undertake the predictive procedure. Although all of these achieved better than chance agreement, only three results could be considered as significantly different from chance.

Microfilm \$2.60; Xerox \$9.00. 197 pages.

MOTIVATION AND SOCIAL ADEQUACY

(L. C. Card No. Mic 60-1141)

Vivian Prague Gourevitch, Ph.D.
Columbia University, 1959

The present study was designed to test certain hypotheses about the relationship between motivation and social adequacy, and motivation and neuroticism. An individual's characteristic motivation was conceived as embracing all those reinforcers which influence his behavior, irrespective of any particular drive state. Specific reinforcers were classified as "concrete" or "abstract" depending upon their nature, and as "internal" or "external" depending upon whether they are primarily self-mediated or externally bestowed. This classification yielded four categories of reinforcement which were ordered into a "motivational hierarchy" as follows: I--Concrete, internal (e.g., physiological satisfactions, safety); II--Concrete, external (e.g., praise, affection, money); III--Abstract, external (e.g., social approval, prestige); IV--Abstract, internal (e.g., self-approval, self realization). The hierarchy was intended to reflect the hypothetical development of an individual from primary

reinforcers to the acquisition of secondary reinforcers of a kind which permit increasing independence from immediate environmental circumstances. It was argued that this increased independence should, in turn, result in more stable and effective social functioning. Because almost all the subjects manifested some familiarity with reinforcers classified at the "highest" level of the supposed hierarchy, it was not possible to determine whether, in fact, different levels of development existed. The hypotheses actually tested were that ratings on this "highest" level (IV) of the hierarchy are (a) positively related to social adequacy and (b) negatively related to neuroticism.

The subjects were 36 normal, white males with a mean age of 36.0 years who volunteered their services in order to earn money for their church. Ratings of the subjects' social adequacy were obtained from the Worcester Scale of Social Attainment, a self-report questionnaire which provides information about the individual in the areas of occupation, marriage, and social participation. Ratings of neuroticism were obtained from the Maudsley Medical Questionnaire, a 40-item inventory of common neurotic complaints on which the subject checks those statements which are true of him. Two independent measures of motivation were used: The Behavior Interpretation Inventory (BII), and the Role-Taking Task (RTT). Scores on the Self Approval scale of the BII correspond to level IV motivation, representing the number of times the subject chose this reinforcement over other possible alternatives. The RTT is an individually administered test in which the subject takes the roles of the various actors in stories he tells. RTT protocols are scored for the number of reinforcers belonging to each level of the proposed motivational hierarchy, and yield a score for each level. Subjects were also given the WAIS vocabulary test. Social Class indices, based on occupation and source of income, were computed for each subject.

Both hypotheses were supported by the Self Approval scale of the BII. The RTT provided only ambiguous support for the first hypothesis, and no support for the second. It was found that all the RTT motivation scores were dependent upon the subjects' verbal productivity in the Role-Taking situation, and this verbal productivity was itself related to social adequacy. RTT verbal productivity emerged, in fact, as the most effective predictor of social adequacy in the present study. Additional findings, arising from a consideration of RTT motivation sub-scores, suggested that some specific motivational areas are related to social adequacy and neuroticism. Most of these suggested relationships, with a few striking exceptions, were in accord with the hypothesis.

A revision of the hierarchical concept of motivation was discussed. The results suggested that it was not familiarity with abstract, internal reinforcement which was important in social adequacy and neuroticism, but rather the choice of this reinforcement over others. Possible interpretations of RTT verbal productivity were explored. Microfilm \$2.50; Xerox \$5.40. 109 pages.

THE CONTRIBUTION OF SELECTED VARIABLES TO SUCCESS OR FAILURE IN A VOCATIONAL REHABILITATION EVALUATION

(L. C. Card No. Mic 60-1105)

Wilfred Haber, Ph.D.
New York University, 1959

The Problem

This study investigated the usefulness of selected variables in determining the potential of disabled persons to complete with success a vocational rehabilitation evaluation. The specific variables were age, sex, years of education, duration of the disability, general mental ability, ability to perceive and reproduce geometric figures, freedom from attention disturbances, possession of clerical aptitude or adequate manual dexterity.

Hypothesis

It was hypothesized that all of the variables mentioned above would relate significantly to over-all success in the vocational rehabilitation evaluation, and that they would relate in a particular order based on the magnitude of the correlation coefficients.

Population

Sixty-one disabled individuals were utilized for this study. These were persons who had been processed at the Institute for the Crippled and Disabled to enter a vocational evaluation. Almost all the major disability groups were represented except the deaf and the blind. The sex breakdown was 53 males and 8 females. The age range was 17-58 years with a mean of 38.44. The range of education for the group was 0-16 years with a mean of 8.61. The range of length of disability for the population was 1-42 years with the mean 10.54.

Methodology

Information regarding the demographic variables was obtained by requesting a history from each subject. Data for the other variables were obtained through standardized test devices such as the Oral Directions Test, the Digit Span Subtest of the Wechsler Bellevue Intelligence Scale, the Bender Gestalt Test, the Minnesota Clerical Test, and the Purdue Pegboard Test. The five criteria that the variables were compared with, based on functioning in the vocational evaluation were clerical quality, clerical quantity, mechanical quality, mechanical quantity and over-all performance rating. The latter category indicated the individual's potential to enter a training program, or for direct placement.

Correlation coefficients were computed between the variables and each of the criteria to determine the magnitude of the relationship which existed between them. The degree of significance at the .05 and .01 level was determined for each correlation. The interrelationship of certain variables was also computed.

Conclusions

The mean test scores were below those of the fiftieth percentile for the standardization norms and the standard

deviations were very high. This appeared to confirm the opinions of a number of experts in the testing of the disabled in regard to the presently existing test devices being inadequate for this population.

The variables age, sex, and years of disability were not significantly related to any of the criteria. Years of education was very significantly related to clerical functioning and significantly related to over-all performance. All the other variables correlated very significantly with all the criteria. A significant relationship also existed between the variables in the interrelationship study.

Several important conclusions were possible based on the results of this research. Three tests, the Bender Gestalt, the Minnesota Clerical and the Purdue Pegboard appear to provide more information regarding the disabled person's capacity to complete with success various aspects of the vocational evaluation than any other devices tried in this study. It may also be possible now to question or contradict the traditional theory that factors such as age, sex or how long a person has had a disability affect a disabled person's vocational potential.

Summary

This research revealed that certain variables correlated very significantly with success in the vocational evaluation. Several other variables, particularly certain demographic ones did not relate significantly. The mean and standard deviation scores for the tests which were utilized were not representative of results obtained for the general population.

Future research should provide new norms for the tests that were utilized which would be helpful to counselors in the field of rehabilitation. A more refined statistical analysis would provide more complete predictive data for the use of individuals screening persons for vocational rehabilitation evaluation services.

Microfilm \$2.50; Xerox \$5.60. 111 pages.

LEVEL OF COGNITIVE AWARENESS: ITS MEASUREMENT AND RELATION TO BEHAVIOR.

(L. C. Card No. Mic 60-1068)

Harrie Fox Hess, Ph.D.
University of Colorado, 1959

Supervisor: Assistant Professor Milton Lipetz

This study was designed to investigate the relation between one's awareness of the categories of experience which he uses in interpreting events and the adaptiveness of his behavior. Kelly's Personal Construct Theory provided the theoretical framework within which the study was designed.

The problem of the relation between awareness of concepts and behavior is a basic one for cognitive theory and a central problem within personality theories. Whereas verbal report is usually used as the sole criterion for awareness, the present study considered awareness as an intervening variable, inferable from many kinds of behavior but identical to none.

Kelly's construct of level of cognitive awareness (LCA) provided the formal theoretical definition of the psychological variable which the study attempted to investigate. The three general hypotheses which the study investigated are as follows:

(1) The extent to which an individual is aware of the categories by which he orders his experience is relatively invariant over all situations.

(2) The general psychological adjustment of individuals is positively related to the extent to which they are typically aware of the conceptual bases of their behavior.

(3) Specific patterns of psychological adjustment can be predicted from knowledge of an individual's position on the level of awareness dimension.

The research design consisted of the following steps:

(1) Obtaining measures of LCA on the sample of 43 college students used in the study, (2) Obtaining samples of behavior in other tasks eliciting behavior theoretically related to LCA, and (3) Obtaining measures of general adjustment and of specific patterns of adjustment on all subjects. Finally, measures of the intelligence of all subjects were obtained in order to test the relation between LCA and intelligence.

Five measures of LCA were obtained from Kelly's Role Construct Repertory Test (RCRT). Three of these measures, the Complexity measure, the Range of Convenience measure, and the Range of Convenience of Public Constructs measure, are theoretically related to LCA through the relationship of Kelly's construct range of convenience to LCA. The fourth RCRT measure, the Submergence measure, is related to LCA through the relation of the Kellian construct submergence to LCA. The fifth measure, the Rank-agreement measure, is related to LCA through the presumed relation between ability to verbalize constructs and LCA.

Behavior theoretically related to LCA was elicited in two problem-solving situations. The first of these was the Alternative Conceptualizations Test (devised by the author for this study), which required that the subjects construe objects in alternative ways. The second consisted of two Einstellung tasks: the Water Jars Test and the Word Mazes Test.

The hypothesis that awareness of concepts is related to adjustment was tested by correlating the RCRT LCA measures with the E (Emotional Stability) scale of the Guilford-Zimmerman Temperament Survey (GZTS). The hypothesis that awareness of concepts is related to specific patterns of adjustment was tested by correlating the RCRT LCA measures with the R (Restraint) and T (Thoughtfulness) scales of the GZTS, and with the Hysteria and Denial Scales of the Minnesota Multiphasic Personality Inventory.

The results provided some support for the first general hypothesis in that some of the RCRT LCA measures were related as predicted to the problem-solving measures, and in that the RCRT LCA measures, with the exception of the Rank-agreement measure, were inter-correlated positively to varying degrees. The second and third hypotheses were not supported. Suggestions for the improvement of the measures and procedures were presented in the discussion of the results.

The results of the research were interpreted as providing tentative support for the idea that awareness of categories of experience is related to adaptiveness of behavior. Also, some predictive utility was demonstrated

for the Kellian constructs of complexity and range of convenience. Microfilm \$2.50; Xerox \$6.00. 122 pages.

PSYCHOLOGICAL AND SOCIAL-PSYCHOLOGICAL CORRELATES OF MARGINALITY IN NEGROES

(L. C. Card No. Mic 60-1190)

Robert Olin Kirkhart, Ph.D.
The Ohio State University, 1959

This study concerned itself with psychological and social-psychological correlates of marginality in Negroes. Marginality referred here to the socially peripheral status assigned to the Negro minority group by the privileged majority. The purpose of this study was to investigate, empirically, the nature of the Negro's reaction to his minority group status, and to explore the relationships between this reaction and several other variables.

The major independent variable in this study was in-group versus out-group identification. Two techniques--the Negro Identification Incomplete Sentences Blank (NIISB) and the Structured Interview--were used to determine whether an individual identified with his Negro group was ambivalent toward it or rejected it in favor of striving for acceptance from whites.

The relationship between the subject's reaction to his minority status and the variables of leadership choice, prejudice toward other minorities, belief in internal versus external control of reinforcements, status striving, preferences in music, gradations of skin color, and religious affiliation, were then studied.

The subjects in the study were 76 Negro male college students at the Ohio State University. Forty-six of the subjects were members of the three Negro social fraternities on the University campus. These subjects were tested in a group situation, and the NIISB was used as the measure of Negro identification. The remaining 30 subjects were students from introductory psychology and sociology classes. These subjects were tested individually and the Structured Interview was employed as the measure of Negro identification.

The following hypotheses were proposed:

1. Negro identifiers would tend to be nominated for "internal system" leadership situations; majority group strivers would tend to be nominated for "external system" leadership situations.
2. Negro identifiers would score lower in prejudice against other minority groups.
3. Negroes would obtain higher Internal-External Scale (I-E Scale) scores than whites.
4. Negro identifiers would obtain lower I-E Scale scores than would majority group strivers.
5. Negro identifiers would score lower in status striving than majority group strivers.
6. Negro identifiers would tend to prefer "cool jazz" and "art" performers, while majority group strivers would tend to prefer "commercial" performers.
7. Negroes with darker skin color would tend to be Negro identifiers.
8. Negro identifiers would tend to be members of traditionally Negro-open churches, such as the Methodist and Baptist churches.

The results obtained were interpreted as follows: Negro identifiers were found to be chosen more frequently for both "internal system" and "external system" leadership roles.

Negro identifiers were not found to be particularly low in prejudice against other minorities, although there was a trend for majority group strivers to be high in prejudice.

No significant difference was found between the I-E Scale scores for Negro students and white students.

No significant difference was obtained on the I-E Scale between Negro identifiers and majority group strivers. However, on the NIISB identification measure the ambivalents were found to be higher in external control than either the Negro identifiers or majority group strivers.

Although a significant difference was not obtained between the Mobility Achievement Scale scores of the Negro identifiers and the majority group strivers, trends in the hypothesized direction were obtained.

No difference in preference for "cool jazz" or "commercial" performers was found between Negro identifiers and majority strivers. The hypothesis that stated that Negro identifiers would tend to prefer the "art" group was confirmed.

Darker skin color was found to be associated with high Negro identification as measured by the Interview identification measure.

The prediction that Negro identifiers would tend to be members of the traditionally Negro-open Methodist and Baptist churches was not supported.

Microfilm \$2.50; Xerox \$7.20. 151 pages.

A RORSCHACH STUDY OF THE EPILEPTIC PERSONALITY

(L. C. Card No. Mic 60-673)

Joe Love Lawson, Jr., Ph.D.
University of Kentucky, 1951

This study is an evaluation of the theoretical concept of "epileptic personality," using the Rorschach technique. One of the questions that was considered important was: Are there signs or groups of signs in the Rorschach records of a number of grand mal epileptics which would serve to substantiate or negate the findings of other investigators who studied mixed groups of epileptics, and are these traits found in the Rorschach records of non-epileptics?

The Rorschach protocols of forty male patients diagnosed as "Epilepsy, Grand Mal," were employed in this study, making up the experimental group, while forty Rorschach records of male patients diagnosed as "schizophrenic reaction, paranoid type," and forty Rorschach records of male patients diagnosed as "Anxiety Reaction" were used as the control groups. Only those patients were used in this study whose diagnosis had been confirmed by history, psychiatric, and neurological examination. None of the epileptic patients were institutionalized, and none were considered to be psychotic or deteriorated.

The mean age of the three groups used in this study was within the 30-34 years range and the mean I. Q. of the three groups was within the range of 91-110, which is average.

Some of the results and conclusions from this study are summarized below:

1. Approach: The epileptics are more likely to stress the whole areas of the blot, and to neglect the rare, infrequently seen details.
2. Response Total: The epileptics averaged 17.48 responses per record, as compared to 23.90 responses per record for the paranoids, and 21.88 for the neurotics.
3. F%: The epileptics had a mean F% of 76.95, as compared with 70.55 for the paranoids, and 78.93 for the neurotics.
4. A%: The epileptics had a mean A% of 52.13, as compared to 41.38 for the paranoids, and 47.50 for the neurotics.
5. Popular Responses: The epileptics averaged 4.63 P responses per record as compared to 5.13 for the paranoids and 5.56 for the neurotics.
6. T/1R: The epileptics had a mean T/1R of 28.63 seconds, as compared to 38.14 seconds for the paranoids, and 31.28 seconds for the neurotics.
7. VIII-X:R Ratio: The percentage for the epileptics was 31.95, for the paranoids 28.63, and 31.28 for the neurotics.
8. Experience balance: The epileptics showed an average EB of 1.35/2.04, as compared to 1.40/2.50 for the paranoids, and 1.35/1.94 for the neurotics.
9. S (White Space) Responses: The epileptics produced fewer S responses than either of the other two groups. The epileptics produced 4.7 percent S responses, as compared to 11 percent for the paranoids, and 8.5 percent for the neurotics.
10. Rejections: The epileptic group rejected almost twice as many cards as did either of the other two groups; 44, as compared to 23 for the paranoids and 26 for the neurotics. This was significant at the 2 percent level between the epileptic and paranoid groups.
11. M Responses: No significant differences were found in the use of M between epileptic, paranoid, and neurotic patients.
12. C Responses: No significant differences were found in the use of C, CF, and FC by the three groups.
13. Y Responses: The difference in the use of FY between the epileptics and paranoids was significant at the 5 percent level, with fewer epileptics utilizing this determinant. Between the epileptics and neurotics a significant difference was found at the 2 percent level in the use of YF, with more neurotics utilizing this determinant.
14. V Responses: No significant differences were found.
15. Content: A significant difference was found at the 1 percent level between the epileptic and paranoid groups in the use of Hd, with fewer epileptics giving this response. Significant differences in the use of H and A were found between the epileptic and neurotic groups, with fewer epileptics giving this content.
16. Types of Movement Responses: Differences in responses were found to be not statistically significant.
17. This study would seem to indicate that grand mal epileptics as a group: (1) have a constricted productivity, (2) tend to be stereotyped in their thinking, (3) are attempting to conform in their perception of the world, but are not too successful, (4) are constricted emotionally and have difficulty handling environmental stimulation, (5) display very little anxiety, and (6) may utilize autistic fantasy formations as a wish-fulfilling, need-gratifying activity.
18. The data derived from this study does not substan-

tiate the findings of other investigators in regard to the Rorschach test in epileptics. Possible reasons for this were pointed out.

19. It was concluded that this study does not confirm the existence of a typical "epileptic personality" pattern for grand mal epileptics, as shown by the Rorschach test.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

SOME ASPECTS OF CHANGE PROCESS IN PERSONAL CONSTRUCT SYSTEMS

(L. C. Card No. Mic 60-1194)

Frances Enid Smith Lemcke, Ph.D.
The Ohio State University, 1959

Personal construct theory assumes an individual's psychological processes to be constantly evolving in the direction of improved understanding and prediction of his environment. These processes are best understood, according to this theory, through the individual's constructs, i.e., the dimensions across which he perceives and orders his environment, and especially his social world. These construct dimensions of the individual and his use of them are predicted by the theory to be ever-changing, and also to be changing in particular directions. This study attempts to substantiate some of these predictions.

The group used was freshman women in their first three months of college dormitory living experience. The instrument was a modification of Kelly's Role Construct Repertory Test.

Predictions made and results found:

1. Amount of change in relation to specific representative persons (figures) is related to the amount of change in relation to construct dimensions.
(supported)
2. Figure change would be greater than construct change.
(partially supported)
3. The over-all curve of generalization of change across the variables of degree of change and similarity would not be the classic sloping line,
(supported)
but, rather, a curve starting with little change in most similar figures, rising, and then falling again.
(supported)
4. The degree of "threat" or change would differentiate between individuals who followed the classic generalization sloping line and those who followed the second type.
(largely supported)
5. Construct dimensions and figures would become less similar and more differentiated, i.e., there would be increased cognitive complexity,
(not supported)

and there would be wider application or increased range of convenience of construct dimensions.

(supported)

6. Dependency dimensions would be less extremely used (very much or very little) and their allocation would become wider.

(supported)

7. "Psychological" and "dynamic" construct dimensions would increase in number and use, while "value" dimensions would decrease.

(supported except for increased application of "value" constructs)

Further analysis is made of these findings, with especial note of the group, its stage of development and life situation, and the effect of this on the results. Suggestions are offered for further research, and particular plea is made for similarly testing the change process predictions of personal construct theory in different life situations and at different stages of development.

Microfilm \$2.50; Xerox \$5.40. 106 pages.

THE WORK ATTITUDES OF CHRONICALLY ILL AND AGING PERSONS: A COMPARISON OF THE WORK ATTITUDES OF TWO GROUPS OF PATIENTS REFERRED TO A SHELTERED WORKSHOP IN A MUNICIPAL CUSTODIAL INSTITUTION.

(L. C. Card No. Mic 60-1085)

Patricia Jane Livingston, Ph.D.
New York University, 1959

This study dealt with the work attitudes of chronically ill, aging patients institutionalized in a municipal custodial hospital. It was designed to test the differences in work attitudes between a group of patients who accepted work in the hospital Sheltered Workshop and a similar group which rejected work.

All subjects were residents of the hospital, over the age of 45 years, diagnosed as chronically ill but able to work, and able to understand and speak English. They were further equated in terms of their group characteristics on six factors: sex, age, marital status, religion, race and nationality. The only distinction between the two groups was the criterion of acceptance or rejection of work.

A Questionnaire was devised to record biographical data. Medical data were obtained from two Medical Review Cards. Work Attitude Scale I, consisting of 42 open-end sentences with three alternative answers, was designed by the investigator. Work Attitude Scale II consisted of 37 items chosen from the Minnesota Multiphasic Personality Inventory and which had been shown in a previous study to be relevant to work attitudes.

Biographical and medical data were collected for all subjects. In addition, the two Attitude Scales were administered to all subjects. As a check on the responses given to the Questionnaire and scale administration, twenty subjects (ten from each group) were seen in an interview focussed on work.

The data from the Questionnaire and the Medical Review Cards were tabulated. The Attitude Scales I and II were scored. The interviews were tape-recorded and the Interview Protocols were assigned ratings reflecting positive or negative work attitudes by three judges.

The relationships between the criterion of acceptance of work, and the biographical and medical factors, the Attitude Scale Scores and the Protocol Ratings were tested for statistical significance. Where statistically significant relationships were found, correlation coefficients were calculated to determine the strength of the relationships.

The results of the study supported the hypotheses which it was designed to test, namely:

1. The rejection of work is an expression of a generalized negative work attitude.
2. The acceptance of work is an expression of a generalized positive work attitude.
3. The analysis of responses to attitude scale items and interview sessions relating to work will demonstrate differences in work attitudes between a group of patients which rejects work and a similar group which accepts it.

The results of the study did not support the hypothesis that the analysis of data from biographical and medical reports will demonstrate differences between a group of patients which rejects work and a similar group which accepts it.

Specifically, the study revealed the following in support of the statements above:

1. The criterion of acceptance of work is not significantly related to any of the specific biographical or medical factors studied, with the single exception of years of residence in the United States for those born elsewhere, acceptance of work being associated with a shorter residence in this country.
2. The criterion of acceptance of work is significantly related to scores on Attitude Scale I, the Combined Scale, and to verbal behavior in an interview session as measured by judges' Protocol Ratings, but not to scores on Attitude Scale II.
3. The specific biographical and medical factors studied are not significantly related to scores on Attitude Scale I, Attitude Scale II, or the Combined Scale, nor to the Protocol Ratings.
4. There are significant interrelationships between the scores on Attitude Scale I, Attitude Scale II, the Combined Scale, and the Protocol Ratings, between the scores on Attitude Scale II, the Combined Scale, the Protocol Ratings, and between the Combined Scale and the Protocol Ratings.

Microfilm \$2.50; Xerox \$7.60. 162 pages.

INTERNATIONALISM, SEX ROLE AND AMOUNT OF INFORMATION AS VARIABLES IN A TWO-PERSON, NON-ZERO SUM GAME.

(L. C. Card No. Mic 60-766)

Daniel Robert Lutzker, Ph.D.
The Ohio State University, 1959

Three separate experiments were performed attempting to relate variables outside of game theory to performance in a two-person, non-zero sum game. The three

variables used were internationalism, sex role and amount of information.

In the first experiment it was found that internationalists were significantly more cooperative in the game than were isolationists. However, the internationalists did not differ from the control group in regard to their playing of the game. It is suggested that the difference found between the Internationalist Group and the Isolationist Group is due to a greater competitiveness among isolationists as opposed to cooperativeness among internationalists.

It was also found that the internationalists did not exhibit a strong tendency toward increased competitiveness as the game progressed (as did the other groups having full information). This was interpreted as a smaller tendency toward retaliation or else a reluctance to abandon efforts at cooperation. In this respect the internationalists differed from the controls.

No significant differences were found between mixed-sex pairs and the all-male control group in regard to the amount of cooperative behavior exhibited.

Partial information was found to have the effect of creating a high level of competitiveness that remained stable throughout the game. With full information the degree of competitiveness was lower in the early part of the game and increased as the game progressed until it reached a level comparable to that found in the partial information group.

The implications of the study for future research in game theory, attitudes and personality are discussed briefly. Microfilm \$2.50; Xerox \$3.00. 53 pages.

AN INVESTIGATION OF CERTAIN PSYCHOLOGICAL VARIABLES IN DIABETES MELLITUS

(L. C. Card No. Mic 60-683)

Harold Webb Meek, Sr., Ph.D.
University of Kentucky, 1951

The purpose of this study was to examine a group of patients with diabetes mellitus by means of certain accepted psycho-diagnostic procedures in order to ascertain whether or not certain meaningful variables could be discovered which correlate with the differential symptom picture which these patients present.

The investigation was predicted upon the assumption that although true diabetes mellitus is a specific disease entity, diabetic patients will portray a wide range of both diverse and similar psychological characteristics.

From a pilot study it was determined that the only variables which were significantly related to the particular type of diabetic reaction were the duration of the illness and the frequency of recurrent symptoms. These two variables were then studied in four groups: short duration, manageable patients; short duration, recurrent patients; long duration, manageables; and long duration, recurrences. There were twenty cases in each group.

The most prominent characteristics of the short duration, manageable group are the large percentage of depressive signs. The most characteristic Rorschach variables of the short duration recurrent group are anxiety signs.

The long duration, manageable group is not significantly

different from the short duration, manageable group in any of the three diagnostic categories. This suggests that among manageable patients the duration of illness is not an important variable. The Rorschach records of the long term, manageable patients are characterized by depression with but a slight and insignificant increase in organic signs. However, the long term, recurrent group is markedly different from the short term, recurrent group in terms of organic signs. This means that among the recurrent patients duration of illness is an important variable. This is in sharp contrast with the manageable patients who are not affected by the duration of illness. Therefore, the anxiety present in recurrent patients and which produces the metabolic variations, if permitted to continue over a period of time, would seem to produce general organic deterioration. The factor of age is not critical since the mean age of the long duration manageable group is .5 years less than the long duration, recurrent group.

Thus, the hypothesis that the particular physiological reaction of a patient of diabetes mellitus is specifically related to the personality configuration of the patient seems to be clearly substantiated in testing that hypothesis. However, that diabetes is a progressively deteriorating disease must be modified, since these diabetics only showed an increase of organic signs in certain cases. Neither age nor duration of illness, as such, are determinants of this reaction. Again, only in certain cases did these factors contribute significantly in the reaction to the disease.

Implications of This Study

Among six variables which were examined in the exploratory study, it is important that the only two which produced significant differential results were the duration of the illness and the frequency of recurrent diabetic symptoms. This clearly suggests that under certain circumstances diabetes is a progressive disease, and on the basis of this study the variations of sugar level is the critical factor.

This also suggests that the severity of the disease can be most accurately defined in terms of the frequency of recurrent symptoms rather than the pancreatic deficiency or the daily dosage of insulin required.

The findings of this research as interpreted above have certain implications for an adequate management of the diabetic patient. On the basis of these differential observations it can be said that specific personality configurations are associated with various psychological reactions to the disease.

If the relationship between psychological and physiological is a psychosomatic one, psychotherapeutic care as a part of the total regimen would reduce the anxiety symptoms among recurrent diabetic patients. It follows that a reduction of this anxiety in the early stages of the disease would obviate some of the deterioration which would develop if the anxiety were prolonged.

Microfilm \$2.50; Xerox \$6.00. 124 pages.

THE INFLUENCE OF RESPONSE CONDITIONS ON RECOGNITION THRESHOLDS FOR TABOO WORDS

(L. C. Card No. Mic 60-833)

Siegfried H. Nothman, Ph.D.
Indiana University, 1959

Two experiments were conducted to determine the effect of method of responding on recognition thresholds for taboo words. It was hypothesized that the perceptual defense phenomenon can be accounted for on the basis of response inhibition. Therefore, it was predicted that under response conditions other than the customary pronouncing of neutral and taboo words in full, the differences between neutral and taboo word thresholds would significantly diminish.

In Experiment I, the effects of four modes of response on recognition thresholds were investigated by using four groups consisting of twenty-one subjects each (15 males, 6 females). The modes of response were 1) the customary oral responding, that is, pronouncing in full the tachistoscopically presented word, 2) writing the whole word, 3) spelling the word components orally, and 4) spelling the word components in writing.

The test stimuli consisted of six taboo words and six neutral words (equated in familiarity), and were exhibited tachistoscopically. Recognition thresholds for the words presented were determined by a modified method of limits.

On the basis of a three-way analysis of variance and inspection of the data, the findings are: 1) oral responding resulted in significantly greater mean differences between neutral and taboo word thresholds than written responding; 2) whole word responding resulted in significantly greater mean differences between neutral and taboo word thresholds than responding by spelling components of words; 3) females showed significantly greater mean differences between neutral and taboo word thresholds than males; 4) the interaction effects between oral-vs.-written and between whole-vs.-components were significant; and 5) the interaction between the sexes and modes of response was not significant.

In Experiment II, all subjects pressed appropriately labeled pushbuttons to indicate discrimination of the tachistoscopically presented words. Three groups of subjects were utilized. One group made the motor response and pronounced the discriminated word in full, another group made the designated motor response and pronounced the components of the discriminated word in reverse order, and a third group made only the motor response.

Each group consisted of 20 subjects (12 males, 8 females). The test stimuli consisted of six taboo words and six neutral words (equated in familiarity). Recognition thresholds for the words presented were determined by a modified method of limits. The response measure was the ratio of the threshold difference between neutral and taboo words to the average threshold.

The findings of a 2 x 3 factorial analysis of variance are: 1) response mode is a significant variable; 2) the effect of the sex variable is not significant; and 3) the interaction between sex and response modes is not significant.

The sex variable is not significant in Experiment II, but is significant in Experiment I. The implications of this were discussed, and it is suggested that males and females do not consistently react differentially in perceptual defense

type studies. This view is supported by the conflicting results reported in the literature.

In both experiments, no significant difference between the groups was found with respect to the neutral word thresholds.

The results in respect to the effect of modes of response on thresholds are interpreted as lending support to the response inhibition hypothesis.

Microfilm \$2.50; Xerox \$4.20. 79 pages.

THE RELATIONSHIP BETWEEN ITEM DIFFICULTY AND INTERITEM CORRELATION IN THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY AND THE GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY

(L. C. Card No. Mic 60-882)

Wayne Orlando Pearson, Ph.D.
Cornell University, 1960

The Problem

The purpose of this study was to determine the degree of relationship between item difficulty and interitem correlation in scales K, Hs, D, Hy, Pd, Pa, Pt, Sc, Ma, and Si of the MINNESOTA MULTIPHASIC PERSONALITY INVENTORY and scales G, R, A, S, E, O, F, T, and P of the GUILFORD-ZIMMERMAN TEMPERAMENT SURVEY. The study was suggested by a similar study by Jones of the PENSACOLA Z SURVEY.¹ Jones gave the name, polarity, to this item difficulty-interitem correlation relationship. As he points out, in a polarized scale, homogeneity (i.e. average interitem correlation) for high-scoring subjects will be different from the homogeneity for low-scoring subjects.² The practical significance of polarity was explained by Jones as follows:

The implications for tests which are used or intended to be used in both clinical and normal populations are clear. If the test is polarized, its internal properties cannot remain the same in both populations. If track were kept of polarity, we might be able to account for some of the instances in which a clinically developed instrument "falls apart" in a normal population and vice versa.³

Sample

MMPI subjects were 274 Cornell University students who visited a mental health clinic because each student, or someone else, thought that he might need psychotherapy.

GZTS subjects were derived from two sources: (1) a general psychology class which yielded 118 subjects; and (2) 114 students who voluntarily had sought vocational counseling.

Procedure

The following procedure was applied to each of the scales investigated.

1. Difficulty level was determined for each item.

2. Items were arranged in rank order on the basis of difficulty level and then divided into groups of three items to a group, beginning with the three most difficult items and ending with the three least difficult items.

3. Interitem tetrachoric correlations were computed among the three items in each group.
4. The arithmetical mean correlation was obtained for the interitem tetrachoric correlations in each group.
5. These group mean interitem tetrachoric correlations were arranged in rank order with rank #1 being assigned to the group having the highest mean correlation.
6. A Spearman Rho correlation coefficient was calculated between the rankings for item difficulty and the rankings for mean interitem correlation.

Results

For the MMPI scales, the rank-order correlation between item difficulty and interitem correlation in the Paranoia scale was significant at the 1% level of confidence. None of the rhos obtained for the other MMPI scales were significant at the 5% confidence level, although the rhos for scales K, Hy, and Sc were close to being significant at the 5% level.

For the GZTS scales, none of the scales were found to have a rho between item difficulty and interitem correlation significant at the 5% confidence level. The rho values obtained for scales T, R, A, and S were close to being significant at the 5% level, however.

Conclusions

The possibility that n's might easily have been increased led to the following conclusions:

- MMPI Scales Definitely Polarized: Pa.
- MMPI Scales Probably Polarized: K, Hy, Sc.
- MMPI Scales Possibly Polarized: Hs, Pt.
- MMPI Scales Definitely Not Polarized: D, Pd, Ma, Si.
- GZTS Scales Almost Certainly Polarized: T.
- GZTS Scales Probably Polarized: R, A, S.
- GZTS Scales Probably Not Polarized: O, F, P.
- GZTS Scales Definitely Not Polarized: G, E.

Microfilm \$3.55; Xerox \$12.60. 276 pages.

1. Marshall B. Jones, *The Polarity of Psychological Tests*, J. consult. Psychology, 1958, 22, 25-29.
2. *Ibid.*, p. 26.
3. *Ibid.*, p. 27.

SEX POPULARS IN THE RORSCHACH

(L. C. Card No. Mic 60-1228)

Barrie Shaw, Ph.D.
University of Kentucky, 1949

Sexual adjustment and conflict is increasingly being accepted as the pivotal orientation for the understanding of personality disorders. The Rorschach test as a method of personality diagnosis is the best known and most widely used projective technique but the sex facet of the personality is only inferentially explored in the standard Rorschach technique. Frank sex responses are given infrequently.

This situation gave rise to the basic problem of this research. Could a supplementary procedure, employing the standard Rorschach Cards, be devised which would elicit material relevant to the understanding of the sexual dimension of the personality? The answer to this question was sought in the effort to establish sex popular responses on the Rorschach test and to investigate sexually valent areas of the cards.

In cases of blocked or reticent subjects where the Rorschach protocols are meager, the Klopfer procedure of testing the limits is often employed as a supplementary technique for eliciting additional material. This practice suggested the procedure for eliciting and investigating sex content responses in this study. The important problem was to determine whether these responses would occur with a significant frequency and agreement in both area and gender in a testing the limits procedure.

The materials employed in this experiment were a series of the Rorschach cards and the Rorschach Psychodiagnostic shadowgraphs or location charts.

The subjects for this experiment were 100 students who were attending the University of Kentucky. There were 50 males and 50 females. All the subjects were volunteers solicited by the examiners while the subjects were in their individual rooms at the dormitories. They had no previous knowledge concerning the nature of the experiment or familiarity with the Rorschach. The female students were examined by a woman examiner, and the men were examined also by a member of their own sex. The age range of the men was from 17 to 31 years, with a mean age of 21. The women's age ranged from 17 to 23 with a mean age of 20. All subjects were unmarried at the time of participation in this experiment.

The major results of this study were as follows:

a. The combined group of 100 subjects, 50 men and 50 women, established 14 sex populars. An arbitrary criterion was used to define a sex popular. When 20% of the population agreed on a sex response in both area and gender it was designated a sex popular response.

The male group established 13 sex populars. In this group of 50 men it was necessary for an area to attain an agreement of 10 or more sex responses to achieve sex popular status.

The female group established 15 sex populars. The criterion employed here for a sex popular was identical with that used for the male group.

The men and women had 11 sex populars in common.

b. The female gender was the predominant sex response category for almost all cards for both groups.

c. The sexual valency was determined for all areas on each card.

d. The results indicate a marked concurrence of behavior by the men and the women in selecting sex areas.

e. The midline location is mutual for practically all highly sexually valent areas.

f. An objective criterion for the employment of Beck's populars in the testing the limits procedure has been established.

g. An intensive integration and summary of all findings as they occurred on each individual card is presented in Chapter V. Here, the interrelationship between Beck's populars and the sex portion of the study, the comparison of the performance of such general Rorschach factors as the sequence of the cards, color shock, content, kinesthetic determinants, and other pertinent Rorschach dimensions, are discussed.

Now that some objective indicators of the sexuality of the Rorschach Cards have been disclosed several important clinical applications and research projects are possible. For example, a project is already under way in which the nuances of sexual screening and symbolism in Rorschach protocols are being investigated by employing the criteria established in this study. Further research possibilities are suggested in Chapter VI and two clinical cases are given as illustrations of the potential value of the findings of this study in a clinical context.

Microfilm \$2.70; Xerox \$9.45. 208 pages.

AN INVESTIGATION OF RELATIONSHIP BETWEEN
UNDERLYING UNPLEASANT FEELING TENSIONS
AND CANCER GROWTH: A COMPARATIVE STUDY
OF TWO GROUPS OF CANCER PATIENTS
DIFFERENTIATED ON THE BASIS OF
CANCER COURSE.

(L. C. Card No. Mic 60-1094)

Miriam Harriet Lubell Shrifte, Ph.D.
New York University, 1959

This study investigated the relationship between underlying unpleasant feeling tensions and cancer growth. The research population was indigent women between the ages of thirty and sixty who had undergone hysterectomy for cancer of the cervix. The observational criterion was cancer course: which subjects did not continue to grow cancer and which subjects did. The psychological variables, the extent and the quality of underlying unpleasant feeling tensions, were determined by means of the Rorschach Test and the De Vos system of analyzing, categorizing, and quantifying Rorschach content for its affective components. There were fifteen subjects in the good-cancer-course group and seven subjects in the bad-cancer-course group.

All the subjects were tested and analyzed for their feeling tensions. Comparisons were made between the two groups in regard to extent and quality (hostility, anxiety, and bodily preoccupation) of underlying unpleasant feeling tension. The statistical devices were the Mann-Whitney U-Test and the Fisher-Yates Exact Test.

It was found that the subjects did not differ from one another in any respect except in their tendency toward bodily preoccupation. All the subjects showed a pathological degree of underlying unpleasant feeling tension. Those who did not continue to grow cancer showed a slightly greater tendency toward bodily preoccupation than those who did continue to grow cancer.

To probe the meaning of these findings an additional study of the Rorschach protocols of all the subjects was made. It was found then that there was a personality difference between the two groups. The bad-cancer-course group, contrary to the good-cancer-course group, showed a tendency which was interpreted as indicative of wasteful productiveness. The good-cancer-course individuals, according to this interpretation, were either not wasteful in their productiveness or else did not tend to be productive. A quantification of this difference indicated a statistical significance of .005. This difference was corroborated by two cross-validation tests.

With a concept of wasteful or useless productivity as a frame of reference, the previous findings--including those of this study--which related personality with cancer were reexamined. It was possible logically to resolve the various findings and to find a theoretical place for unpleasant feeling in those who develop cancer and for the function of the bodily preoccupation aspect of unpleasant feeling.

The conclusions were that in indigent English-speaking women of eastern United States culture between the ages of thirty and sixty who have undergone hysterectomy for cancer of the cervix:

1. Underlying unpleasant feeling tension does not relate to cancer growth. That is, cancer may develop or not, regardless of the extent or quality of these tensions.

2. A ratio of non-movement to movement intact, full-grown mammal Rorschach percepts does relate to cancer growth. That is, persons whose movement side of the ratio is greater than their non-movement side tend to continue to develop cancer; and persons whose non-movement side is greater than or equal to their movement side tend not to continue to develop cancer.

The interpretation of this ratio was that: 1) the movement side indicates inward productive tendencies; 2) the non-movement side indicates exchange with the outside world; 3) when the movement side is in excess of the non-movement side, processes of unused productivity exist.

It was tentatively concluded that the oft-suspected role of unpleasant feeling in cancer development is actually an association between unpleasant feelings and processes of unused productivity. The hostility and anxiety components appear to associate with high, and the bodily preoccupation component with low processes of wasteful productivity.

Suggestions were made for further research.

Microfilm \$2.50; Xerox \$7.20. 153 pages.

A STUDY OF CHANGE PROCESS
DURING PSYCHOTHERAPY

(L. C. Card No. Mic 60-1218)

Jean Stoner Tippet, Ph.D.
The Ohio State University, 1959

This investigation was concerned with certain change processes occurring in patients during a period of initial psychotherapy ranging from three to six months. The changes studied centered around the development of new constructs (i.e., new ways of seeing one's world of people) and their generalization with regard to people, as well as the persistence of old constructs and their increasing discrimination. Also studied were changes in discrimination within a person's construct system as a whole. New construct development was then related to past and present emphasis in therapy with special attention to differences for childhood and present figures. And finally, construct content changes involving dependency, values, extremity of notions, and psychological and dynamic approaches were studied.

Additionally, the same set of hypotheses was used to predict both for general trends in the group and for each case separately. Thus the general hypotheses were tested not only in terms of over-all trends of prediction, but were

also modified and given meaning in terms of individual cases. It was hoped that this kind of dual application of hypotheses would help to bridge the gap between the general experimental approach and the clinical approach, and to spell out the more practical implications of an experimental study.

The above changes were viewed in terms of Personal Construct Theory and then were conceptually translated into Behavior Theory as elaborated by Miller and Dollard and into Psychoanalytic Theory whenever possible.

A total of 20 patients and 14 therapists were initially involved in the investigation. The various data on change were obtained from the responses of the patients to a pre-test form and two post-test forms of the REP Test, an interpersonal sorting procedure developed within personal construct theory. Therapy emphasis sheets were filled out by each therapist. These gave information which determined whether a given therapy was to be classified as past emphasis or as present emphasis for the hypotheses in which this was a variable.

It was found that with regard to generalization and discrimination the most notable changes occurred with new constructs and present figures. These took the form of increasing discrimination both among people and within the construct system itself. The over-all trend of increasing discrimination was more comprehensive than had been anticipated.

When therapy emphasis was related to change it was found that present emphasis gave many more changes in present figure constructs than did past emphasis, as well as considerably more total pattern changes. Present emphasis also brought about greater complexity of the verbal construct system as a whole.

When changes in construct content types were studied several rather clear trends became evident. Dependency constructs not only decreased in number but became more restricted to childhood figures. However, there was an increase in dependency allocations which indicates more acceptance of the dependencies still existing and increasing recognition of a wider range of people as being available for help and reliance. For value constructs it was found that although a person becomes less judgmental with regard to people in general, he becomes at the same time freer to express what negative judgments he does have. There was, however, less expression of positive judgments.

When general hypotheses were modified for individual cases it was found that the individual prediction was an improvement over the general prediction. This approach gives us a method for studying change in relation to the initial status of the patient and the problems present at the beginning of therapy.

Microfilm \$2.50; Xerox \$5.40. 110 pages.

THE EFFECT OF SELECTIVE RESPONDING BY THE THERAPIST IN A QUASI-THERAPY SETTING

(L. C. Card No. Mic 60-1025)

Irene Elkin Waskow, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Barclay Martin

Although many authors have suggested that psychotherapy can be viewed as a learning experience, little research has been directed at uncovering and understanding the types of learning that occur in psychotherapy. Specifically, almost no researchers have examined the relationship between the responding of the therapist and the learning by the patient. It seems possible that selective responding by a therapist early in therapy to certain aspects of a patient's communication may lead to an increase in the occurrence of these aspects. Thus the patient may learn to talk about material that the therapist considers important. This type of learning may be similar to that occurring in experiments of verbal conditioning.

An attempt was made in the present study to reinforce particular aspects of a subject's communications in a quasi-therapy setting. Thirty-six student volunteer subjects were rated on an initial measure of relative amounts of feeling and content expressed, and members of triplicates matched on this measure were randomly assigned to one of three groups. In one group, the therapist responded selectively to feelings expressed by the subject, in another to content matter, and in a third to feelings as they were attached to specific content. This feeling-content factor was chosen because of the stress in the literature on expressing feelings in therapy and on more complex learning which may occur once such feelings are expressed. Subjects, seen for four 30-minute interviews over a two week period, were asked to consider this a counseling situation and to talk about themselves and things that troubled them. The therapist's behavior, aside from the selective responding, was as constant as possible in all groups. The general therapeutic orientation was non-directive.

Analysis of the therapist's responses indicated that the experimental conditions were established reliably. The subjects' responses were rated as consisting predominantly of feeling elements (F), content (C), or a combination (FC). A significant difference was found in the F-FC-C profiles for the three groups, due to a higher percentage of C responses, and correspondingly lower percentage of FC responses, for the C group. No significant trends were found over interviews. Differences among groups were apparent in the first interview. An analysis of this interview revealed a significant difference in quadratic trends for the group category interaction, and an initial increase in the C responses for the C group appeared responsible for the over-all differences found. Thus this group did seem to be reinforced and major effects of reinforcement could be seen within the first third of the first interview. No significant differences were found between the F and FC groups and they showed no clear effects of reinforcement.

Questionnaire results suggested a general lack of awareness by the subjects of the therapist's selective responding. Ratings of the therapeutic quality of the subjects'

communications revealed no differences among groups or between first and fourth interviews, perhaps in part because of the inapplicability of the scale used to a situation this different from psychotherapy.

The major finding was that the content aspects of a subject's communications can be reinforced by a therapist's selective responding in the very early stages of a quasi-therapy situation. The results constitute an extension of successful verbal conditioning into a complex situation resembling psychotherapy. The finding that content, but not feeling, aspects of the subjects' communications could be reinforced was interpreted as due to differential willingness on the part of the subjects to have different types of material reinforced. It was suggested that this factor of willingness might deserve further study. Additional paths for research suggested were examination of large numbers of therapy protocols for effects of reinforcement and study of extinction of responses reinforced as they were in the present study.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

THE ROLE OF THE ORGANIZATION OF INTELLECTUAL AND EMOTIONAL PROCESSES AS IT RELATES TO PERFORMANCE ON A PHYSICAL REHABILITATION PROGRAM

(L. C. Card No. Mic 60-1095)

Bert Allan Weinblatt, Ph.D.
New York University, 1959

The purpose of the study was to investigate the relationship between the rehabilitation progress of two differentiated groups of patients afflicted with left hemiplegia. The subjects of the study were twenty-six adult male and female patients who had sustained a cerebral vascular accident rendering them left hemiplegic. The patients were hospitalized at Bellevue Hospital on wards designated for physical medicine and rehabilitation. All patients selected met the criteria of age, duration of disability, physical status, cultural background and intelligence.

The subjects were administered a battery of psychological tests soon after admission to the service, comprising the Bender-Gestalt, Goldstein-Scheerer Block Design, Rorschach and Hooper Visual Organization Test. On the basis of the test results, the subjects were placed in one of two groups. The criteria for placement in one or the other group was the degree of disorganization of intellectual and emotional processes. At the time of testing, a brief interview was conducted which was designed to elicit the patient's concept of his disability in terms of an unrealistic or realistic appraisal of his condition. A clinical or data gathering interview was administered to each patient once a week for a total of six interviews. This interview was conducted in an effort to elicit any disruption in the normal rhythms of living which have to do with sleeping and eating patterns, excretory functions and the expression of somatic, interpersonal or environmental complaints.

One week after the patients had started the rehabilitation program, rating scales were filled out by the appropriate therapists in the area of Activities of Daily Living and Ambulation Activities. Six weeks later the therapists

re-rated the patients on the same scales. A measure was obtained of the degree of improvement, if any, made by patients on the rehabilitation program. Information was gained relative to patient's motivation and skills by therapists placing check marks at appropriate points on continuum lines at the bottom of each sheet.

It was hypothesized that patients exhibiting a preponderance of visual-perceptual distortions, visual-motor disturbances, rigidity of thought processes, concreteness in thinking and feelings of impotence, perplexity and perseveration would tend to make significantly less progress on a physical rehabilitation program than would patients who manifested an absence or minimum degree of the above signs. It was further hypothesized that a positive relationship exists between the disorganization of intellectual and emotional processes in left hemiplegics and the disruption of the normal rhythms of living as outlined earlier.

The results of this study utilizing the *t* ratio and the Kolmogorov-Smirnov goodness of fit technique indicate that patients exhibiting a preponderance of disorganization of intellectual and emotional processes made significantly less improvement in physical rehabilitation than did patients within normal limits. Analysis of interview data reveal more unrealistic attitudes regarding their illness manifested by the disorganized group as compared to the normal group. There was a lack of significant difference between the two groups in patterns of sleeping and eating; however, significant differences were found to exist between the two groups in patterns of excretory functions and the expression of somatic, interpersonal and environmental complaints.

Qualitative findings reveal depression to be equally present in both groups, anxiety was more pronounced in the disorganized group and severe denial of illness or anosognosia was found to be present in the disorganized group and not in the normal group. Patients in the normal group tended to exhibit a greater increase in motivation during the six weeks' period while patients in the disorganized group manifested a greater increase of skills (motor performance) during that same period.

Microfilm \$2.50; Xerox \$6.20. 126 pages.

PSYCHOLOGY, EXPERIMENTAL

THE IMPORTANCE OF SELECTED DESIGN VARIABLES IN QUALITATIVE INSTRUMENT READING

(L. C. Card No. Mic 60-1173)

Julien Martin Christensen, Ph.D.
The Ohio State University, 1959

An important problem in the design of a modern complex system is that of determining how best to present to the operators the information they need regarding the system's performance. Dials have been found to be useful and economical devices for the presentation of a wide range of information. It is only recently that studies have shown that slight variations in the design of fundamental

dial parameters may make surprising differences in their interpretability and, thus, their general usefulness. A series of four experiments (of which two are described in the dissertation) employing tachistoscopic control of the major independent variable was undertaken in an attempt to clarify some of the fundamental relationships among selected design parameters and to provide information directly useful to designers.

The major variables considered were moving pointer-moving scale, clockwise-counterclockwise scale, practice, separation between adjacent dials and exposure time. It was found that most of these variables exerted significant primary and interactive effects. The procedure of inducing errors in an experiment by the expedient of reducing tachistoscopic exposures was shown to be hazardous because of both qualitative and quantitative differences in relationships with respect to exposure time.

In addition, the pattern of interactive effects is simplified by giving the subjects more information. The interactions of practice with other variables suggest strongly that this variable should receive careful consideration in planning experiments in this area. In a more specific vein, it appears that the optimal direction for numbering scales (i.e., clockwise versus counterclockwise) for moving pointer dials is independent of the reading of the dial, whether it is to be read quantitatively or qualitatively; while for moving scale dials, clockwise scales appear to be better for quantitative reading and counterclockwise scales appear to be better for qualitative reading. This latter finding, if verified, would seem to represent a serious limitation of moving scale dials.

Finally, it is suggested that dials are of such importance in the successful operation of most of man's modern systems that it would appear fruitful to expend a moderate amount of time and money in an effort to determine the best method of designing them.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

THE RELATIONSHIPS OF INTERMITTENT NOISE, INTER-SIGNAL INTERVAL, AND BASAL SKIN CONDUCTANCE TO VIGILANCE BEHAVIOR.

(L. C. Card No. Mic 60-1278)

Joseph Francis Dardano, Ph.D.
University of Maryland, 1959

Supervisor: Dr. Sherman Ross

The effects of low-intensity, intermittent white noise and variation of inter-signal intervals on monitoring behavior were investigated. The task consisted of monitoring a 5 in. cathode ray tube screen for a period of 3 hrs. in an isolated environment. The critical signal was a 3 in. amplitude sine wave which appeared at the average rate of once per minute. A background signal similar to the critical signal except for an amplitude of 2.5 in. blinked periodically at the rate of once per second. Observers were 36 enlisted men without specialized training.

The noise condition consisted of intermittent, fluctuating noise presented for durations ranging from .5 min. to 5 min., for 15 min. of each half-hour, varying in intensity from 73 to 93 db during the noise intervals and

remaining at 68 db during the quiet intervals. The quiet condition was the constant 68 db background noise. Inter-signal intervals were varied in terms of the dispersion of the distribution of five intervals in each of three signal programs. The narrow dispersion program had inter-signal intervals of 50, 55, 60, 65, and 70 sec.; the intermediate dispersion program, 30, 45, 60, 75, and 90 sec.; and the wide dispersion program, 10, 35, 60, 85, and 110 sec. Each inter-signal interval was presented six times each half-hour.

The observer's vigilance level was inferred from the reaction time to the critical signals. Skin resistance was sampled every 15 sec. to explore any systematic trends during the session and any relationship to the performance criterion.

Average performance of the six Ss monitoring the narrow dispersion schedule under the quiet condition maintained an efficient level throughout the session. However, average performance of the six Ss with this schedule under the noise condition exhibited a deterioration during the first hour, then a constant level for the remaining 2 hr. The effect of the noise was assumed to be a disruption of the temporal discrimination. The intermediate and wide dispersion schedules, with or without noise, did not differ. Performance under these conditions exhibited a nearly continuous deterioration. More false reports were committed with these schedules than with the narrow dispersion schedule.

The relationship between reaction time to a signal and the length of the inter-stimulus interval preceding that signal was a decreasing monotonic function for the narrow dispersion quiet condition. Under the narrow dispersion schedule with noise and the intermediate dispersion schedules, with or without noise, reaction time decreased at least up to the mean inter-stimulus interval. No consistent trend was present under the wide dispersion schedule.

Conductance trends for all Ss except one demonstrated a systematic trend during the vigil. Conductance was negatively correlated with the logarithm of reaction time for seven of 12 Ss monitoring the wide dispersion schedule, for five of 12 Ss under the intermediate dispersion schedule, and for one S under the narrow dispersion schedule. In the group monitoring the wide dispersion schedule, which required continuous attendance, the five Ss without a significant correlation demonstrated better overall performance and less deterioration relative to the seven Ss with a significant correlation. The conductance trends of these five superior Ss demonstrated an immediate increase at the start of the session and a higher than initial level for a minimum of 1 hr.

Research in the area of vigilance and theoretical frameworks to explain the findings are reviewed.

Microfilm \$2.50; Xerox \$5.00. 98 pages.

THE RELATIONSHIPS AMONG PSYCHOMETRIC,
EXPERIMENTAL, AND OBSERVATIONAL MEASURES
OF LEARNING ABILITY IN INSTITUTIONAL,
ENDOGENOUS MENTALLY RETARDED PERSONS.

(L. C. Card No. Mic 60-1036)

Jack Wayne Fleming, Ph.D.
University of Colorado, 1959

Supervisor: Associate Professor Glenn Terrell, Jr.

The belief that mentally retarded persons constitute a homogeneous group has led to many corollary beliefs, two of which were the major problems investigated. The first is that subnormal intelligence is permanent, and that mentally retarded persons have no potential to function above their present level of intelligence. The second is that mentally retarded persons lack the ability to learn.

All endogenous mentally retarded persons with an IQ score between 50 and 80 were selected from the Ridge State Home and Training School, Wheatridge, Colorado. Forty-one adults and sixteen young adolescents were obtained.

Five subtests were chosen from the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Intelligence Scale for Children (WISC) which were shown to have a high combined correlation with standard scores. Regression equation estimates of Full, Verbal, and Performance Scale scores based on these correlations were used.

Psychometric measures were obtained by administering the subtests to each subject. All failed items were readministered in order to arrive at a "potential intelligence" score. The difference between standard and potential intelligence scores, a discrepancy score, was interpreted to indicate the extent to which subjects experienced "interfering responses" in the test situation. For this reason it was predicted that potential intelligence scores would provide better estimates of non-test behavior, whereas standard intelligence scores would provide better estimates of test behavior. A high correlation between standard and potential intelligence scores ruled out the possibility of testing this hypothesis. It was hypothesized that interfering responses occur more readily on verbal tests than on performance tests, and that the Verbal Scale discrepancy score would be significantly larger than the Performance Scale discrepancy score. The results were in the predicted direction, but failed to reach statistical significance. It was expected that the discrepancy score would be negatively related to measures of learning in test situations, but positively related to measures of learning in non-test situations. Both predictions were supported.

Experimental measures were obtained by a learning set procedure. Seventy-two problems involving abstracting ability were administered. It was expected that the subjects would improve in their ability to solve the problems. Because the solution of the problems involved abstracting ability, it was expected there would be a positive relationship between intelligence test scores and learning set scores. Both hypotheses were supported.

Observational measures were obtained by having school teachers and work supervisors rate the subjects on eight scales. Data for only a portion of the subjects were obtainable. It was expected that both intelligence test scores and learning set scores would be positively related to ratings of learning ability in school, and that learning set

scores would be positively related to ratings in a non-test, work situation. Although the results were in a predicted direction, only a positive correlation for adults between verbal intelligence and ratings of learning ability in school was statistically significant. A positive relationship between learning set scores and ratings of learning ability in a work situation suggested that improved measurement techniques would result in a significant relationship.

It was concluded that the concept of potential intelligence is not yet sufficiently refined to justify its use in research; that the "interfering responses" hypothesis can probably account in part for the commonly observed lack of relationship between test and non-test behavior, but that further validation is needed; that mentally retarded persons do have some abstracting ability, but are many times unable to demonstrate this ability verbally; that significant relationships between intelligence scores and experimental measures of learning can probably be demonstrated when the behavioral processes involved in the two situations are conceptually related; and that construct validity might require that intelligence tests be avoided in studies of mental retardation, and attempts be made to devise measurements of other aspects of behavior.

Possible limitations in typical learning experiments were discussed and suggestions made for improvement.

Microfilm \$2.50; Xerox \$7.20. 152 pages.

DEVELOPMENT AND EVALUATION OF AN
EMPIRICAL PATTERN-SCORING METHOD
FOR PREDICTION

(L. C. Card No. Mic 60-1250)

Edward William Forgy, Ph.D.
University of Oregon, 1960

Adviser: Leona E. Tyler

The accuracy with which human behavior can be predicted by objective methods is of considerable practical and theoretical importance. Conventional empirical procedures, particularly the multiple regression method and its approximations, have achieved considerable success, but their way of using information to make predictions remains vulnerable to logical objections. Especially criticized is the process of weighting each predictor in a fixed way, independently of the context of other information in which it occurs.

However, the failure of recently advanced pattern prediction methodologies has left open the question of practical alternatives to the conventional additive methods. Reasons are advanced for the lack of success in the methods so far tested, and a method is proposed which attempts to satisfy these. Basic to the proposed method are the following ideas:

1) Possible forms of relationships between predictors and a criterion can be thought of as a hierarchy closely analogous to the hierarchy of the "main effect" and the successive "orders" of "interaction" which are separated and tested by Analysis of Variance methods.

2) Each separate order of predictor-criterion relationship requires a characteristic kind of scoring method to best exploit it for prediction. Interactions require various types of pattern scoring.

3) The different forms of additive and pattern weighting methods would best supplement each other. Since each is designed to exploit a different kind of relationship, each may contribute uniquely valid variance to the prediction of a criterion.

The proposed method was worked out in detail, programmed for a digital computer, and tested on several sets of prediction data. Each set of data was of the simplest possible form: all predictors and criteria were dichotomous. Because of the complexity and length of the processes of searching for and scoring interactive relationships, the method was actually carried out only on the lowest order of interaction, which involves pairs of predictors. The data analyzed were from a military and an academic setting in which the predictors were subjects' answers to multiple-choice life history and personality items, respectively. In the academic data, several criteria were predicted from the same set of items.

The proposed method was evaluated by comparing it with a conventional additive item analysis procedure of the same degree of refinement. On cross-validation samples the predictive accuracy of each was observed, and tests were made to determine whether the differences were statistically significant.

The method as originally proposed failed to improve predictions to any statistically significant degree. A change was then made in the item-pair analysis procedure to make it detect precisely the sort of relationship actually presumed by the item-pair scoring system. This revised method, though no longer so clearly analogous to Analysis of Variance concepts, produced statistically significant improvements in two of the four sets of data. However, the greatest increase in predictive validity was only from $r = .368$ to $r = .425$.

Because of the expense and complexity of this pattern-scoring method, even the maximum degree of improvement achieved would rarely be of practical significance. The failure of almost all other general pattern-scoring methods to achieve large gains suggests that interactions themselves may usually be so infrequent, weak, or correlated with single predictors that they cannot be usefully exploited by any method. It may be that work on specific hypotheses (about the location of interactions) leading to custom-made sets of predictors would ultimately produce more useful results. The results of this study are also seen more generally as demonstrating the limited and conditional applicability of the notion of context, and as bearing upon the conditions for possible superiority of clinical versus statistical prediction.

Microfilm \$2.50; Xerox \$4.60. 87 pages.

AN EXPERIMENTAL STUDY OF THE EMPIRICAL VALIDITY OF HYPNOTICALLY INDUCED AMNESIA AND REGRESSION

(L. C. Card No. Mic 60-1110)

Harold Norman Hansen, Ph.D.
New York University, 1959

Introduction

The experimental evidence to date is highly inconclusive with respect to the validity of post-hypnotically

induced amnesia and regression. Much of the disagreement may be attributed to the tendency to utilize validation criteria which are subject to manipulation by the hypnotized individual. Other contributing factors are paucity of subjects, lack of rigorous experimental procedure, inadequate statistical treatment. Most of the investigators would seem to agree with Sarbin's (1) explanation of role-playing.

Basic Hypotheses

It was hypothesized that post-hypnotically induced amnesia and regression were valid phenomena with reference to respiratory, cardiac, and galvanic skin response measures. The hypothesis was also made that hypnotizable subjects would be able to simulate stress, amnesia, and regression whereas non-hypnotizable subjects would not be able to do so.

Subjects

Twenty subjects were selected from a population of two hundred forty-six males. The ten experimental subjects were required to demonstrate an ability to achieve a state of deep trance as defined by the Davis and Husband Scale of Suggestibility (2). The ten control subjects were required to demonstrate an inability to achieve more than a hypnoidal state as defined by this scale.

Experimental Procedure

An average baseline was established for each physiological variable for the experimental and control group (condition B). All subjects were dealt with on an individual basis throughout the experiment. No experimental condition was introduced until the responses to the immediately preceding condition had reached a baseline level.

Condition I was directed at testing the individual's ability to simulate a stress reaction. Condition II tested the subject's reaction to stress (gunshot). From this point through the end of the experiment all subjects were exposed to a series of continuous gunshots fired at one-minute intervals. Condition III tested the subject's reaction under neutral hypnosis. Conditions IV and V provided information about the subject's ability to simulate respectively amnesia and regression. Condition VI tested the subject's reaction when given a post-hypnotic suggestion for amnesia for the entire experimental procedure of the day. Condition VII tested the subject's reaction when given a post-hypnotic suggestion for regression to a time prior to Condition I.

Conditions III, VI, and VII were peculiar to the experimental group (hypnosis employed); Conditions B, I, II, IV, and V were common to both experimental and control group.

Results and Conclusions

A three-part analysis of variance was used followed by t-tests between means.

Post-hypnotic amnesia and regression: A comparison of the reactions obtained under Condition II (initial stress) versus the reactions obtained under respectively Condition VI (post-hypnotic amnesia) and Condition VII (post-hypnotic regression) was made. A significant difference existed between these means with reference to pulse rate and PGR measures. The means were identical with reference to I-fraction. It was concluded that post-hypnotic amnesia and regression could be regarded as valid phenomena.

Suggestibility and physiological reactivity: Neither the experimental nor control group could simulate stress, amnesia, or regression as indicated by a comparison of the reactions obtained under Condition II (initial stress) versus respectively Conditions I (simulation of stress), IV (simulation of amnesia), and V (simulation of regression).

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Microfilm \$2.50; Xerox \$5.40. 109 pages.

STRESS AND PERCEPTION: THE EFFECTS OF INTENSE NOISE STIMULATION AND NOXIOUS STIMULATION UPON PERCEPTUAL PERFORMANCE.

(L. C. Card No. Mic 60-392)

William Harris, Ph.D.

University of Southern California, 1959

Chairman: Professor Grings

The purpose of the study was to investigate some basic empirical relationships between two different stressors and perceptual performance. The stressors were intense noise and noxious stimulation (electric shock). It was assumed the intense noise was representative of a class of stressors that included high-intensity stimuli and the noxious stimulation was representative of another class that included painful or "threatening" stimuli. The following hypotheses were tested: (1) perceptual performance under prolonged exposure to intense noise stimulation can be described by a characteristic decrement-increment-decrement curve; (2) noxious stimulation of symbols related to perceptual test stimuli will result in a decrement in perceptual performance; (3) noxious stimulation plus noise exposure will result in an even greater decrement in perceptual performance than will noxious stimulation alone.

A perceptual test was designed and developed for use in the study, an 8-item "Object-Identification Test." Each item consisted of an ordered series of seven line drawings: the first drawing in each series was a relatively ambiguous cue; details were added to each successive drawing until in the last drawing an easily recognizable common object (e.g., a key) was pictured. The drawings were projected individually on a screen for 4 seconds; S's task was to identify the object to be pictured in the last drawing. The test was standardized upon an independent group of Ss.

It was assumed that performance on the test involved central nervous system integrative processes and that the intense noise and noxious stimulation variables would "interfere" with those processes.

Two experiments were performed, each using 40 under-

graduate students as Ss. In Experiment 1 all Ss first received 16 discrimination trials in which the name of one perceptual test object was paired with electric shock (8 trials) and the name of another test object was simply presented (8 trials). The perceptual test was then performed by 20 Ss during 20 minutes exposure to continuous 100 db noise, and 20 Ss performed the test under nonnoise conditions. Galvanic skin responses were continuously recorded during the experiment. The procedure in Experiment 2 was exactly the same, except that there were only 8 discrimination trials (4 name-shock trials and 4 name-only trials).

Results. Hypothesis 1 was confirmed in both experiments: the obtained curve showed first a decrement, then an increment, and again a decrement in perceptual performance as a function of noise exposure. Hypothesis 2 was confirmed in both experiments: the mean score on "reinforced" test items was significantly higher ("poorer") than on "nonreinforced" items. Hypothesis 3 was not confirmed in either experiment. There were significantly larger galvanic skin responses to "reinforced" items than to "nonreinforced" items.

Conclusions. If meaningful interpretations are to be made about the effects of intense noise upon performance (and perhaps about the effects of stress, in general), it seems necessary to observe the course of performance during an exposure period. The effects of the noxious stimulation variable on both perceptual performance and galvanic skin responses seemed to be mediated by central integrative processes.

Microfilm \$2.50; Xerox \$7.00. 146 pages.

DELAY OF SHOCK-ESCAPE REINFORCEMENT

(L. C. Card No. Mic 60-826)

Lawson Hill Hughes, Ph.D.

Indiana University, 1959

An experiment was performed to discover the effect of various delays of shock-escape reinforcement on a bar-pressing response and to compare such effects with those obtained with food used as a reinforcer. The values of delay used were 0, 2, 5, and 10 sec. The subjects were 140 male albino rats. The shock source, stabilized d.c. set at 0.4 ma., stimulated S through a commutator delivering 50 ms. pulses.

The experiment was designed so as to permit application of the Spence-Grice analysis of delayed food reinforcement which ascribes to secondary reinforcement the role of enabling Ss to learn. This was accomplished by presenting a 4000 c.p.s., 50 db. sensation level tone to some Ss for 1 sec. following each escape response and presenting it again for the duration of the period when the shock was off. Following preliminary conditioning and extinction, the delay and tone-condition variables were combined factorially. Fifty trials were given, with the bar being locked so that it could not be moved following each response and remaining immovable until the shock recurred for the next trial. The latency of the response, defined as the time elapsing between the onset of the shock and the occurrence of the response, was recorded on each trial. Immediately following the fifty trials was a 30-min. period of extinction

(inescapable shock), during which each response was followed by a 1-sec. tone. Total number of extinction responses was recorded.

Results showed that delay of shock-escape reinforcement has an effect on the acquisition of a response similar to that obtained in food studies. When adjusted for performance during preliminary conditioning, the mean latency of the escape response was generally shorter for lesser values of delay of shock escape. When adjusted for performance during preliminary extinction, the mean number of responses in extinction following delay-of-reinforcement trials was generally greater for lesser values of delay. The apparent dissimilarity between this result and the results obtained in maze studies was tentatively attributed to procedural differences. The use of the tones had no measurable effect on latency of response or resistance to extinction. A discussion of experimental arrangements which have produced secondary reinforcers in other experiments led to suggested modifications of the present experimental procedure. Microfilm \$2.50; Xerox \$3.00. 37 pages.

DIFFERENTIAL PREDICTION WITH INCOMPLETE CRITERION DATA

(L. C. Card No. Mic 60-859)

Richard Morton Johnson, Ph.D.
University of Washington, 1959

Chairman: Paul Horst

This study concerns the prediction of multiple criteria when there are incomplete criterion data. Such circumstances frequently occur in contexts such as the statistical prediction of college grades, where not every student takes one or more courses in each academic area.

It is shown that when there is missing criterion data the appropriate criterion is the conditional event, "success given that individual *i* participates in criterion activity *j*." It is also shown that the multiple regression model which yields appropriate predictive information is the "method of subgroups," which employs data from only the subgroup of individuals who participate in criterion activity *j* for the determination of regression weights for the prediction of activity *j*.

While the method of subgroups has certain optimal properties, it entails great computational labor when there are a large number of criterion variables. Two variants of the "method of total groups" are discussed. The total group methods employ total group predictor data in the calculation of each vector of regression coefficients, thus removing the necessity of obtaining predictor intercorrelation matrices for all criterion subgroups. While the total group methods involve a substantial saving in computational labor, the extent to which their predictions approach the predictions of the method of subgroups is largely unknown.

The method of subgroups and two total group methods are compared in a large-scale prediction study. It is found that the total group methods suffer only slight disadvantages over the method of subgroups, which become marked only as the sizes of the subgroups increase. It is concluded that the total group methods are satisfactory when the subgroups are of size less than a few hundred.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

DIMENSIONAL ANALYSIS, LATENT STRUCTURE, AND THE PROBLEM OF PATTERNS.

(L. C. Card No. Mic 60-860)

Clifford Earl Lunneborg, Jr., Ph.D.
University of Washington, 1959

This study was concerned with the development of a technique of analysis dependent upon what is here termed the configural dimensionality of a set of psychological measures. This technique was proposed as an approach to the problem of evaluating the importance of patterns or profiles of item or test responses.

The problem of patterns arises from the criticism of traditional test scoring procedures that linearly combining item or test responses results in a loss of information inherent in the patterning or configuration of the responses. It has been known for some time (Horst, 1941) that this pattern information may be embraced by conventional psychometric techniques provided powers and products of the original variables are included as additional variables. This approach--termed the general polynomial approach for that characteristic expression embracing higher order power and product terms--has given rise to a number of researches which have been reviewed in this study. The present research enjoys this same orientation.

If pattern information is present for a set of measures over a sample of respondents, then, in terms of the general polynomial formulation, the higher order power and product terms should provide sources of variation independent of the variation possessed by the original measures. For the purpose of the present study, this proposition was recast in a form suitable to test by techniques conventionally associated with factor analysis. Simply stated this new proposition was that the rank of a matrix of observations on a set of psychological measures augmented by higher order power and product terms should be greater than the rank of the matrix of observations on the original variables considered by themselves if any pattern information is present in those observations. That is, additional independent sources of variation are necessary to account for the power and product terms. Procedures have been developed in this study for relating this formulation to the principal axis solution developed by Horst (1953) and for restricting the rank determinations to sources of reliable variance. A method for handling the large number of power and product terms has been included in this study and limitations on its use have been explored.

The method has been illustrated with data drawn from a study (Campbell, 1959) of the dimensionality of personality data. No evidence of the presence of pattern information was established.

Finally, the present technique and the problem of pattern analysis has been compared with the technique of latent class analysis. The latter has been shown to be a form of pattern analysis restricted to somewhat homogeneous sets of measures.

Microfilm \$2.50; Xerox \$4.80. 91 pages.

MOVEMENT THRESHOLDS IN PERIPHERAL VISION

(L. C. Card No. Mic 60-1148)

Franklin Harding McColgin, Ph.D.
Columbia University, 1959

The absolute thresholds of movement were determined at forty-eight positions in peripheral vision. An aircraft-type instrument, with a standard altimeter hand, was located at random positions on the concave, black surface of an eighty inch fiberglass hemisphere. Using constant photopic lighting, four types of movement were investigated, i.e., clockwise and counter-clockwise rotation, vertical and horizontal motion. While the subject fixated on the center point of the hemisphere, the absolute threshold of each type of movement was determined for each position using the method of limits. Ten airline pilots served as subjects. Perimetric charts were drawn illustrating the average absolute thresholds for the different types of movement.

The absolute thresholds of rotary motion with mid-point and end rotation of the instrument hand were determined and compared. The absolute thresholds of rotary motion and linear motion as a function of four different lengths of instrument hands were determined at two locations on the 90 degree radial. The relationship between the velocity and the area swept by the instrument hand in rotary and linear motion, as a function of four lengths of hand, was investigated. A comparison was made of the absolute thresholds of movement perception of rotary motion for uniocular and binocular vision along the zero and ninety degree radials. The subject's head was first in the normal upright position, then turned 90 degrees to the side, with the eyes on a vertical plane.

The major conclusions indicated by the results of this experiment are as follows:

1. An individual's sensitivity to movement steadily decreases as a linear function of the retinal loci from near the fovea to near the periphery of the visual area.
2. The pattern of the absolute threshold isograms for both rotary and linear motion are elliptically shaped, with the horizontal axis approximately twice as long as the vertical axis. The patterns of the isograms are almost bysymmetrical about the major axes.
3. An individual's sensitivity to rotary movement is slightly less for uniocular than binocular vision. For both conditions, the absolute threshold isograms form similarly shaped elliptical patterns. When the subject's head is turned 90 degrees to the side, so that his eyes are on a vertical plane, the elliptical patterns of the isograms also rotate 90 degrees.
4. In the perception of movement in peripheral vision, there is no difference between the ability to see clockwise or counter-clockwise rotation.
5. An individual's ability to perceive vertical motion is slightly better than his ability to perceive horizontal motion in the area adjacent to the horizontal axis, extending out to approximately the seventy degree meridian. In the other areas of the peripheral visual field, there was no significant difference in sensitivity between the two types of motion.

6. The introspective reports of the subjects favored rotary to linear motion. A method was not found to compare the two types of motion quantitatively.
7. Velocity and area swept by the instrument hand are significant factors in the perception of movement, but they are not proportional for different types of movement. The effect of velocity is more significant than area swept by the moving hand. For rotary motion, the tip of the hand is the most significant area influencing the absolute threshold.

Microfilm \$2.50; Xerox \$3.60. 64 pages.

THE EFFECT OF CHLORPROMAZINE UPON AN INTERMITTENTLY REINFORCED ESCAPE RESPONSE

(L. C. Card No. Mic 60-866)

Alan Keith Murray, Ph.D.
University of Washington, 1959

This investigation employed intermittent reinforcement in a single alley runway - using shock as a primary reinforcer and a doorbell as a secondary reinforcer. White rats were first trained under continuous reinforcement, then shifted to a semi-variable - ratio schedule. Under these conditions, the escape response of all of the rats was maintained over six days of acquisition.

Chlorpromazine (1 mgm/kgm, injected intra-peritoneally) served as the independent variable in the experiment. Speed-of-run on non-shock trials was used as the dependent variable. The intent of the investigation was to validate the use of the speed-of-run measure as an adequate dependent variable upon which to test the action of "tranquilizing" drugs.

A 2x2 factorial design was employed. This analysis permits comparisons of drug effects on the training condition and the test condition. The interaction obtained in the analysis tests the influence exerted by any change of stimulus conditions, which may have occurred through sensory or perceptual distortion. Other variables are balanced out in this design.

Sixteen white rats were randomly divided into two groups of eight rats each - a 'drug group' and a 'saline group.' In order to control for effects of handling, time of day, etc., the animals were run in groups of four: each group constituting a replication of the experiment. Two groups were run each day. The rats were run twenty trials every other day - receiving a total of 120 trials over the six-day 'acquisition' period. The intermittent shock trials occurred on the same trial for all rats. The rats were run 1 hour after the injection of 1 mgm/kgm. chlorpromazine or isotonic saline. On the seventh experimental day, the two main groups were randomly divided into the four groups entering into the final comparisons. Half of the 'saline group' now received the drug injection and half of the 'drug group' now received injection of saline - during the 'extinction' phase of the experiment. The remaining animals in each group continued under the same conditions as existed in 'acquisition'.

The results of the investigation supports the following conclusions:

- 1) The escape behavior of white rats may be maintained with only infrequent administration of shock.
- 2) The speed-of-run response, under 'saline' conditions is maintained at a high vigor and evidences considerable stability over both trials and days - when an appropriate reinforcement schedule is employed.
- 3) Chlorpromazine acts to reduce the running speed - this is apparently primarily due to a direct action of the drug and not to sensory and/or motor side effects.
- 4) The ease of establishment, great stability, and demonstrated sensitivity to a relatively innocuous dosage of chlorpromazine - strongly recommend the speed-of-run measure as a dependent variable, upon which to test tranquilizing effects. These characteristics obviate the necessity for: prolonged training, large groups of subjects, and the use of extreme dosage levels.

Microfilm \$2.50; Xerox \$3.00. 50 pages.

THE EFFECTS OF FRUSTRATION ON THE AMPLITUDE OF A SIMPLE MOTOR RESPONSE

(L. C. Card No. Mic 60-943)

Clemens Allen Roehl, Ph.D.
University of Minnesota, 1959

The extent to which human subjects alter the strength of a simple movement in response to information of reward and nonreward was investigated. The subjects were 77 male psychiatric patients. The subjects struck repeatedly with a hammer at a target in a specially constructed apparatus, seemingly as part of a coordination test. Colored lights, the order of whose presentation was set by the experimenter, gave information of success or failure. Conveying information of success (accuracy) was defined as reward; failure, nonreward. The apparatus measured the strength of the blows, and changes in strength in connection with changes in the reward-nonreward schedule were noted.

It was found that introduction of nonreward after reward (frustration) led to a decrease in the strength of blows. This is opposite the predictions of frustration-as-drive theories. Continual rewards produced a progressive increase in force.

There was no relation between the diagnostic groupings of schizophrenia, psychoneurosis, or personality disorder and the various measures of strength of response to the reward-nonreward schedule.

Scores on certain MMPI scales were found to have statistically reliable association with pounding reactions. Subjects scoring high on the Hy scale and low on Es were more likely to continue increasing their strength of response if they initially were rewarded. However, if they initially received nonreward they were more likely to slack off and pound less hard on subsequent trials. It was suggested that the high Hy, low Es subjects overvalue rewards when they are continually received, but they mistrust the rewards when they are interspersed with nonreward. Sub-

jects scoring high on the Hy and Sc scales of the MMPI, high on the Welsh Index, and low on the Es scale were more likely to show greater variation in performance during a period of continual reward. The scores related to greater range are all in the pathological direction, and it was suggested that an inconsistent or inadequate perception of one's self and of the environment would lead to capricious behavior.

The findings seem to be most satisfactorily explained by the formulation that the internal states resulting from information of reward and nonreward (frustration being one of these) act as cues to release a set of learned responses characteristic of each person. In addition frustration acts to increase drive. The type of response to frustration will be more forceful if the task is a simple one and if the subjects are relatively naive because of the increased drive. However, with more complex, learned tasks and with more sophisticated subjects, the learned responses will be more important than the increased drive states. These learned responses will exhibit wide variability because of unique learning histories; and the fact that MMPI variables are related to certain types of responses indicates that type of personality structure is related to the extent and direction of the reaction.

Microfilm \$2.50; Xerox \$5.00. 97 pages.

CLASSICAL SALIVARY CONDITIONING IN DOGS

(L. C. Card No. Mic 60-838)

Martin M. Shapiro, Ph.D.
Indiana University, 1959

The common failure to obtain the traditionally accepted results in various classical motor conditioning experiments led to an attempt to develop new methodology for the investigation of classical salivary conditioning in the dog. Using an improved surgical preparation and employing a well controlled experimental routine, six mongrel dogs were run through a classical salivary conditioning procedure. The design of the experiment called for 3 dogs to receive 100% reinforcement and 3 dogs to receive 50% reinforcement with 8 trials per day for a total of 6 days. A reinforced trial consisted of a 15 sec. presentation of a 75.5 db. S.P.L. pure tone of 1100 c.p.s., whose offset was simultaneous with the onset of the injection of a 5 c.c. solution of 0.2% acetic acid, lasting for 1 sec., directly into the dog's mouth. On a non-reinforced trial the tone, but not the acid, was presented. Each trial entailed bringing the dog into the experimental room, restraining him in the apparatus, leaving him isolated at least one min. before and two min. after the presentation of the stimuli, and returning him to his home cage. During the entire period of the dog's isolation in the experimental room, the salivary secretion of the left parotid gland was recorded in units of 0.0042 c.c.; this was accomplished by the secretion displacing a column of water which fell in constant size drops, short-circuiting the recording apparatus. The minimum inter-trial interval was 20 min., during which time the dog remained in his cage. One 50% group S was discontinued after 4 days; all 100% group Ss were given additional days of training - one received 1 extra day, 2 received 7 extra days. The magnitude of the salivation

was calculated for the 15 sec. interval preceding the presentation of the CS for each trial, in addition to the magnitude of salivation during the 15 sec. CS presentation and the magnitude of secretion in the 15 sec. period following the offset of the CS (which corresponds to the 15 sec. following US onset for reinforced trials). The latency of the salivary response was also determined for the intervals following the CS onset and offset. Only one of the Ss, a 100% group S, showed rapid and consistent development of a conditioned response. The other Ss, including the two 100% group dogs who received a total of 104 trials, never achieved a stable rate of conditioned responding, generally failing to give any salivary response during the CS. A consistent alteration in the UR magnitude could be ascertained for all the animals, the mean UR magnitude showing an initial rise followed by a downward trend. For the one S who conditioned, the relationship between CR magnitude and latency was not monotonic; neither was the slope of the curve for mean cumulative salivation during the CS presentation. The results are discussed in relation to previous procedures and results of classical salivary conditioning. Microfilm \$2.50; Xerox \$5.80. 117 pages.

DURATION OF REINFORCEMENT AND DELAY AFTER REINFORCEMENT IN THE RUNWAY

(L. C. Card No. Mic 60-840)

Dewey Alvin Slough, Ph.D.
Indiana University, 1959

This study was concerned with the effects of two variables on response speed in the runway: time allowed for drinking and delay in the goal box after drinking. It was proposed that delay after reinforcement has roughly the same effect on acquisition and extinction as does partial reinforcement. Partially reinforced animals usually run slower than continuously reinforced animals during acquisition, but appear to reach higher asymptotic speeds when an extended number of trials is given. Also, partially reinforced animals are more resistant to extinction.

Method. During 60 acquisition trials at one trial a day, four groups of rats were given either 5 secs. or 30 secs. drinking time and 0 secs. or 30 secs. delay in the goal box after drinking at the end of each run. For extinction the 16 animals in each group were divided into two subgroups of eight animals each, and given either 5 secs. or 30 secs. confinement in the goal box at the end of each of 20 daily trials.

The apparatus was a straight, enclosed runway, painted flat black. It was divided into start box, alley, and goal box by two guillotine doors which could be lowered to prevent retracing after the animal passed them. The location of the water tube was concealed from the rest of the goal box by a wood partition and the partitioned area contained a metal shield which could be moved forward to prevent access to the water tube. Standard .01-sec. timers were used to obtain measures of starting speed and running speed.

Results. For the groups without delay after drinking, response speeds during acquisition were higher for the long drinking time than for the short drinking time. This is in agreement with other studies. The data of the present

experiment also support the notion that the delay after drinking has effects similar to the effects of non-reinforced trials in partial reinforcement studies. For the large reward groups, the delay animals were slower than the non-delay animals during most of acquisition and appeared to reach higher response speeds at the end of acquisition. However, it seems clear that the effect of delay after reinforcement depends on the amount of reinforcement; in fact, in the groups with small reward the delay animals were consistently faster in response speeds throughout acquisition.

On the early acquisition trials there were more interruptions of the drinking response for the groups without delay. This is likely dependent on the fact that no pre-training was given in the apparatus so that "exploratory" responses had no chance to habituate.

Resistance to extinction was greater for the animals with delay after reinforcement. The larger magnitude of reinforcement led to greater resistance to extinction only for the animals without delay after reinforcement.

During extinction, animals with the short extinction confinement time had faster starting speeds than animals with the long extinction confinement time.

Microfilm \$2.50; Xerox \$3.00. 24 pages.

AN EXPERIMENTAL STUDY OF PERCEPTUAL DEFENSE

(L. C. Card No. Mic 60-875)

Theodore David Tjossem, Ph.D.
University of Washington, 1959

Chairman: Roger B. Loucks

This investigation utilizes a new experimental technique to study the problem of "perceptual defense", and the conceptualization that the perceptual process expresses the functioning of "cognitive attitudes."

This technique, the Picture Perception Test (PPT), employs a masking apparatus which permits the controlled exposure of pictorial stimuli at quantifiable levels of masking. Picture ambiguity ranging from complete masking to full clarity is produced. The realistic picture stimuli used in this procedure are designed so that each picture includes two demand areas. These demand areas command attention and report. By controlling the contrast properties of the demand areas in the design of the pictures, the order of their appearance is controlled as the pictures are exposed in the masking apparatus. The first appearing demand area is designed to become discriminable several masking levels prior to the emergence of the second appearing demand area. This procedure allows for the investigation of the "sets" or "hypotheses" of the perceiver as he moves from the discrimination of the first demand area to the perception of the second demand area.

The Picture Perception Test pictures used in this experiment included four threatening (socially taboo) pictures matched, in terms of content and structure, with four neutral (socially acceptable) pictures. When presented to the subjects in the masking apparatus, the following variables were taken for study: 1) the discrimination thresholds for

the content of the picture demand areas, 2) the galvanic skin responses (GSRs) elicited while perceiving during picture exposures producing correct verbal report discrimination, and during exposures prior to that giving correct discrimination of the demand areas, 3) the GSRs produced during verbal reports for the responses of correct discrimination and for those prior to correct discrimination, and 4) the misperceptions and pre-recognition tactics of the subjects as they moved from the discrimination of demand areas "1" to the perception of the second appearing demand areas "2" of the stimulus pictures.

The Gottschaldt Figures Test and critical flicker frequency, as measures of the cognitive attitudes "leveling vs sharpening" and "tolerance vs resistance to the unstable" respectively, were procedures administered to the subjects in this study. Comparison of subject threshold data from the PPT was made with Gottschaldt and flicker frequency scores to test for the expression of "cognitive attitudes" in the perception of the meaningful content in the PPT pictures.

The effect of moderate alcohol intoxication on the perceptual responses under study was investigated. In addition, an appraisal was made of the PPT technique as a method of clinical investigation.

The results of the investigation indicate that:

1) Increased GSR activity and an increase in frequency of perceptual errors and defensive perceptual tactics occur on the responses prior to correct discrimination of the critical demand areas of the taboo pictures as compared with neutral pictures.

2) Moderate alcohol intoxication alters the pattern of perceptual response. This was indicated by decreased GSRs and less frequent defensive prerecognition defensive tactics on the perceptual responses prior to correct discrimination of the taboo picture critical demand areas as compared with those for the neutral pictures. Further, raised discrimination thresholds for the threatening elements of the taboo pictures were found for the alcohol medicated subjects.

3) Response withholding is not likely as a factor in producing raised discrimination thresholds for the taboo stimuli for both the non-medicated and alcohol medicated subjects. Evidence for this was taken from the observation that the GSRs on verbal reports prior to correct discrimination of the critical demand areas of the taboo pictures gave little indication of autonomic arousal.

4) Critical flicker frequency and Gottschaldt Figures Test scores show no consistent significant relationship to the discrimination thresholds for the meaningful picture stimuli of the PPT. Evidence, then, for the operation of "cognitive attitudes" in the perception of meaningful situations is not found by this investigation.

5) The PPT technique shows promise as a projective method for use in clinical investigation.

Microfilm \$3.60; Xerox \$12.60. 280 pages.

AN INVESTIGATION OF SYMPTOM SEVERITY AND CERTAIN AUTONOMIC AND PSYCHOLOGICAL INDICES OF STRESS IN PARKINSON'S DISEASE

(L. C. Card No. Mic 60-1117)

Herman Weiner, Ph.D.
New York University, 1959

The Problem

This study was designed to investigate the thesis that both autonomic and psychological stress are related to the degree of parkinsonian symptom severity, and that the psychological indices are significantly related to autonomic stress. In addition, the hypothesis that autonomic stress would discriminate symptom severity more effectively than the psychological indices do, was investigated.

Population and Procedure

Forty consecutive parkinsonian patients were selected from among the incoming, potential candidates for alleviative neurosurgery at St. Barnabas Hospital, Bronx, New York. The patient group consisted of eleven females and twenty-nine males whose ages ranged from thirty-one to sixty-nine, with a mean age of fifty-three. All of the patients were tested within the week before undergoing neurosurgery.

Each patient's symptom severity was rated by a hospital neurosurgeon. The two categories of symptom severity used in this study were muscular rigidity and the loss of voluntary movement. As a measure of subjectively perceived stress, the Manifest Anxiety Scale was administered to each patient. Based upon clinical tests and observations, the hospital psychologist made a global Rating of psychological stress-adequacy for each patient. Following customary hospital procedure, this Rating was intended as a prediction of each patient's behavioral reaction to the post-surgical situation and as a prediction of his ability to utilize surgical gains.

Autonomic stress was measured by palmar skin conductance readings taken during consecutive five-minute periods of relaxation and mental stimulation. A palmar skin conductance index of autonomic response maladaptiveness was computed for each patient. This index was constituted of appropriately combined rates of adaptation at rest, arousal to mental addition, recovery from arousal, and the conductance range ratio.

For the statistical analysis of the results, the various scores and ratings were converted to ranks. Rank-order correlation was used to evaluate the strength of association obtaining among the variables and for the purposes of coefficient comparison. Chi-square was used to test the null hypothesis in comparing the constituted mild and severe symptom groups with regard to autonomic and psychological stress. The factors of age, duration of illness, and education were not significantly related to symptom severity or to autonomic stress.

Conclusions

The main findings of this investigation confirmed most of the hypotheses. A substantial degree of association was demonstrated between symptom severity and autonomic stress. A moderate degree of association obtained between symptom severity and the subjective perception of stress. The psychological Rating of stress-adequacy failed to show any relationship to symptom severity. Autonomic stress,

as compared with the psychological Rating, discriminated symptom severity more effectively, but failed to discriminate symptom severity more effectively than did the Manifest Anxiety Scale. Finally, the subjective perception of stress and the psychological Rating of stress-adequacy were, respectively, substantially and markedly related to autonomic stress.

Microfilm \$2.50; Xerox \$5.40. 108 pages.

THE EFFECTS OF PHYSOSTIGMINE AND ATROPINE ON DISCRIMINATION LEARNING IN THE RAT

(L. C. Card No. Mic 60-1080)

James Milton Whitehouse, Ph.D.
University of Colorado, 1959

Supervisor: Associate Professor Maurice P. Smith

This study was an investigation of the effects that physostigmine and atropine have on the ability of rats to learn in a successive discrimination problem. The first experiment compared acquisition among four groups: a placebo control group, an atropine group, and two groups which were injected with different amounts of physostigmine. The second experiment was of the latent learning type and was designed to investigate atropine's detrimental effect on performance. The third experiment investigated the effect of atropine on performance of a minimally

learned response. The fourth experiment was concerned with the effects of atropine on the performance of an over learned response.

Atropine injections resulted in a significant impairment of learning while physostigmine appeared to facilitate learning, but not reliably so. Cessation of atropine injections, after 70 trials, did not affect their performance; these rats continued to perform the same as the animals for whom atropine injections were continued. Injection of atropine both in animals which had not reached criterion and in animals which had been over trained immediately resulted in significant increases in errors.

The findings from the atropine studies are consistent with those of Beck and Mikhel'son, although differences in the degree of impairment due to atropine were noted between Beck's study and the present study.

Possible explanations for atropine impairing performance are discussed. The most reasonable conclusion was that atropine interferes with learning and retention, rather than with strictly motivational or sensory processes. A possible adaptation to atropine in the rat was discussed, but confirmation and understanding of such an adaptation must await future research.

The results of these experiments were interpreted to support the importance of Ach in the relationship of the Ach-ChE-ChA cycle in the central nervous system to behavior. The findings of the experiments were considered to be consistent with Krech's views on the role of Ach in impulse transmission in the central nervous system but the present study did not permit any very definite conclusions about the way Ach functions in the central nervous system. Microfilm \$2.50; Xerox \$3.00. 53 pages.

RELIGION

A STUDY OF THE NEED FOR COUNSELOR PREPARATION IN THE DEPARTMENT OF BIBLE AND RELIGIOUS EDUCATION IN ABILENE CHRISTIAN COLLEGE

(L. C. Card No. Mic 60-1061)

Norris Clyde Campbell, Ed.D.
University of Colorado, 1959

Supervisor: Associate Professor Clarence W. Failor

This study had as its chief purpose the determination of the need for counselor preparation in the Department of Bible and Religious Education in Abilene Christian College. An attempt has been made to provide a basis for building a curriculum in the preparation of ministers that will adequately prepare them for competent discharge of the counseling phases of their work.

Findings were based primarily upon (1) completed questionnaires returned by a jury of experts, (2) completed questionnaires returned by graduates of the Department of Bible and Religious Education, and (3) an evaluation of the current curriculum offerings of the school. A group of counselor competencies was submitted in questionnaire form to twenty-eight experts. Twenty-three of the experts responded and recommended the competencies as being desirable for ministers. A second questionnaire incorporating the jury recommended competencies was formulated and sent to 431 graduates of the Department of Bible and Religious Education. The writer obtained a questionnaire response of 83.52 per cent of the entire population under investigation. The respondents indicated that 88.32 per cent of them preached, 65.55 per cent preached full time and 22.77 per cent preached part time. Of those responding, 87.22 per cent reported that they did counseling, 6.11 per cent reported that they did not do counseling and 6.38 per cent did not report. Most of the graduates reported that they had acquired the counselor competencies which they claimed through experience rather than through academic channels. A hierarchy of counseling problem areas was established by those responding. The graduates gave definite indications of a felt need for additional counselor preparation and a desire to obtain such training if it were available to them.

An evaluation of the current curricular offering in the Department of Bible and Religious Education in Abilene Christian College was accomplished using the following criteria: progressiveness, purpose fulfillment, consideration of the learner, and consideration of the learning process. The current offering was compared as to progressiveness with the offerings of secular schools preparing counselors, seminaries of various religious groups and schools very similar to Abilene Christian College. The present offering was evaluated as to purpose fulfillment according to the purposes stated in the Abilene Christian College catalogue. Various factors of impor-

tance concerning the learner and the learning process were also used in the evaluation of the current curriculum. The evaluation process produced evidence indicating that the current curriculum was not adequate for the preparation of ministers for the counseling aspects of their work. From the findings of the evaluation a group of implications regarding curriculum construction were formulated.

A proposed curriculum was formulated which was based upon the implication for curriculum construction. The proposed curriculum consisted of a reorganization of existing undergraduate courses and the inclusion of several new courses at the graduate level. A graduate program in counselor preparation was suggested wherein the student could work toward a degree in Bible or Religious Education and at the same time take those courses thought to be productive of counselor competencies. Other short courses for non-resident students were also suggested.

Little research has been found to date concerning the competencies in counseling that a minister should have. It is hoped that this study will provide Abilene Christian College and other similar schools with a basis for planning adequate counselor preparation for ministers.

Microfilm \$3.20; Xerox \$11.05. 242 pages.

AUTHORITARIANISM IN THE CONGREGATIONALLY CONTROLLED CHURCH

(L. C. Card No. Mic 60-1108)

Arthur Robert Graham, Ph.D.
New York University, 1959

This dissertation concerns a study conducted to test the validity of three hypotheses pertaining to the nature of leadership in a social group which is democratically conceived and autonomously controlled. These hypotheses state that in such a group (1) there is divergence between the professed objectives of the individuals in the group and those formally set down by the group as its objectives, (2) there is a divergence between the formalized relations of sub-groups in the organizational hierarchy and the actual working inter-relationships of those groups, and (3) the formalized democratic organization is aberrated by these divergences between group goals and the sum of the individual goals, and there is a tendency on the part of leadership toward authoritarian measures to compensate for these obstacles and to maintain efficiency of organization in terms of realized goals.

These hypotheses were tested in a small congregationally controlled church of some 155 members. The plan of investigation was divided into two major parts. The first segment consisted of the use of two questionnaires to determine if there were divergence by individuals from the stated objectives of the group and to determine if there

were divergence between the formalized relations in the organization and the actual working relations between groups. These same questionnaires were used to test the hypotheses in a group of twenty non-members of the church to give a measure of comparison of replies.

The second segment of testing involved interviews with three elected leaders of the church. These persons were asked to comment on the background of organization of the group and then were asked to describe, analyze, and comment on two crisis situations affecting group organization. Each leader had first-hand knowledge of the situations. Each was asked to describe the kind of leadership which emerged. These interviews were recorded on sound tape and in writing.

A listing panel of three persons was formed to analyze the content of the taped interviews. On the basis of Kurt Lewin's division of leadership into categories of command, directive, and democratic characteristics, standards of content analysis were established for the use of the panel. Each leader's interview was analyzed separately by each panel member, twice by audition and once from the manuscript. Comparisons were noted and agreements recorded.

The results of the investigation showed evidences of group disorganization. There was sufficient divergence between professed goals of individuals and formal goals of the group (26.5 percent of the replies supported the first hypothesis) to raise doubts as to the group's ability to get consensus about its purposes. The second hypothesis, that there was divergence from the formal organizational hierarchy in the direction of informal operational structures, was maintained by a 32.4 percent response.

On the basis of the questionnaire returns which measured the nature of the communication failure, content analysis (as related to the third hypothesis) showed that such a hiatus was a cause of the use of authoritarian method by leaders in given crisis situations. The crises arose from failure to communicate goals and methods to the group members and the inability to give them proper motivation and attitudes for working as an efficient group. The hiatus of communication was also exploited to create conditions in which authoritarian methods could be used.

Microfilm \$2.60; Xerox \$9.00. 200 pages.

SOME EVIDENCE FOR CONGRUENT ONTOLOGY IN RELIGION AND PHILOSOPHY

(L. C. Card No. Mic 60-1150)

Thomas Rodolphe Martland, Jr., Ph.D.
Columbia University, 1959

This dissertation aims to offer evidence for the thesis that in certain respects there is a congruence between philosophy and religion.

Chapter one presents some religious examples in which certain features appear that later chapters will show to be congruent to philosophy. This chapter includes ancient religions which provided a cradle for our Western civilization, Canaan, Greece, and Christianity. Whatever else we may say about their witness, these religions reveal a common polarity of process and structure. By means of the attributes of their gods, they reflect an orientation to changing life and its significance in the con-

struction of the future, plus a seemingly conflicting orientation toward the direction of life and its measure and control of the changing process itself. These illustrations show that this polarity is not identically the same in each case, but that within each particular cultural variation it does exist.

The philosophical material which this dissertation presents in order to show the congruence of philosophy and religion is that literature critical of pragmatic naturalism in America from approximately 1900 to 1950, and pragmatic naturalism itself as represented by William James and John Dewey. This material was chosen because of its extreme difference from the religions chapter one discusses. Pragmatic naturalism's alleged separation from, and indifference to, and perhaps even antagonism toward any religion, made its use a more crucial test of the thesis that religion and philosophy have a congruence, than would, say, Hellenistic philosophy.

Chapter two is specifically concerned with the criticism of pragmatic naturalism. Whatever else we may say about it, this discussion also reveals a polarity of process and structure. To the extent that each contributor was critical of pragmatic naturalism he understood that philosophy to be a methodological "tough-minded" attempt to find an ultimately significant place in the world for aspiring desire, change and satisfaction. In other words, he interpreted pragmatic naturalism as an attempt to assert the validity of process. Therefore to the extent that each contributor was a critic of pragmatic naturalism, every positive contribution to the discussion centered on the need for structure, measure, or form to give the process its meaning and direction. Whether it is just to pragmatic naturalism or not, the critical discussion reduced itself, first, to an understanding of that philosophy as expressing only an orientation to changing life and its significance in the construction of the future, and secondly, to an assertion of the validity of the other orientation, the orientation concerned with the direction of the changing life process itself by measure and order.

In a sense chapter three and chapter four are supplementary, because to some extent chapters one and two already establish the congruence of philosophy and religion. Both chapter one, dealing with religion, and chapter two, dealing with philosophy, reveal a similar polarity of process and structure. However, there is a flaw in this seeming congruence. Chapter one ends with the process and structure poles coexisting in each religion whereas chapter two seems to end with an understanding of pragmatic naturalism as exclusively a process philosophy to which the critics must add structure. In order to show that this flaw is not valid, chapter three presents a detailed examination of William James' philosophy and chapter four presents that of John Dewey's. These chapters aim to prove that James and Dewey are aware of both poles and that they find a place within their empirical philosophy for them. Whether their particular declaration of the place for structure and process in the ultimate nature of things is satisfactory or not is not at issue. What is important is that pragmatic naturalism transcends its emphatic process orientation and thinks also in terms of order and direction. Thus the incongruity of chapter one and two is ephemeral. The thesis that in certain respects there is a congruence between philosophy and religion is strengthened.

Microfilm \$3.55; Xerox \$12.40. 274 pages.

THE WORDS OF JESUS
AND THE FUTURE OF THE "Q" HYPOTHESIS.

(L. C. Card No. Mic 60-1161)

Theodore Roos Rosché, Ph.D.
Columbia University, 1959

Chapter One acknowledges that the recent spate of literature which attacks the "Q Hypothesis" is not without its significance. However, it is suggested that literary criticism generally has upheld the validity of the view that the gospel of Mark was used by the gospels of Matthew and Luke. Once this point is granted, it becomes necessary to examine how Matthew and Luke used Mark (a known source) before any statements can be made about "Q" (an unknown, hypothetical source).

Chapter Two contains an examination of how the gospel of Luke used Mark. Through statistical and literary analyses, it is suggested that the author of Luke treated the words of Jesus taken from Mark with more care than the narrative material taken from the same source. Only sixteen real changes of the content of Mark's sayings can be found in Luke's versions. Where other changes occur, they are demonstrated to be of a grammatical and stylistic nature. This chapter also contains several possible explanations for these facts, centering around Luke's understanding of the Semitic "word" as containing power and his concept of Jesus as teacher.

According to Chapter Three, the gospel of Matthew used Markan sayings more carefully than Markan narratives. The whole structure of Matthew was predicated upon the distinction between Jesus' words and deeds. Only eight real changes in content have been found in Matthew's versions of Markan sayings as contrasted with the myriad changes of Markan narrative material.

Chapter Four contains a comparison of the orders in which Matthew and Luke put the sayings of Jesus taken from their common source Mark. In both cases, the small number of changes in order is insignificant when contrasted with the changes of narrative pericopae taken from the same source.

Chapters Five and Six attempt to suggest the significance of the previous examination of triple tradition. The method of comparing Markan material in Matthew and Luke when discussing non-Markan "Q" is defended on the grounds that, when both Matthew and Luke used a common Markan saying, almost all the words found in the shorter non-Markan version are found in the other form of the saying. It is acknowledged that Mark cannot be reconstructed from triple tradition just as "Q" cannot be reconstructed from double tradition. However, the faithfulness with which both Matthew and Luke used a common source Mark can be demonstrated when triple tradition is examined after Mark has been removed.

Chapter Six contains an examination of the non-Markan common material which is the basis of reconstructions of "Q." Only one-third of these non-Markan verses have a verbal correspondence which can be considered necessary to show dependence upon a common written document. There is no common order between them. The position is defended that some qualification is necessary to show why Matthew and Luke do not exhibit the same degree of correspondence in the non-Markan common material as is found in triple tradition when Mark is removed.

The conclusion of the thesis suggests that only two

mutually exclusive alternatives are possible for future investigations of the "Q Hypothesis." The one affirms that there was a common non-Markan document ("Q") but that Matthew and/or Luke did not choose to follow the same literary methods they used when they appropriated sayings from the known source Mark. The other position affirms that, because the non-Markan material does not exhibit the same degree of correspondence in most of its pericopae, there was no common document "Q." This position affirms that whatever similarities exist in non-Markan material must be explained in ways other than that they had a common written document between them.

Microfilm \$4.35; Xerox \$15.30. 337 pages.

JUSTIFICATION AND ESCHATOLOGY
IN THE THEOLOGY OF SAINT PAUL

(L. C. Card No. Mic 59-5238)

Nigel Mott Watson, Ph.D.
Princeton University, 1959

Pauline thought contains the paradox: justified by faith, judged by works. Faith for Paul is the antithesis of self-reliance or works. Therefore, if we understand justification as an anticipation of the Last Judgment, as many Protestants do, then we have two antithetical modes of divine procedure, of which the one is yet the anticipation of the other.

Chapter ii begins by defining "eschatology." Eschatological action realizes the original purpose of God in His creation. The meaning of the root *Tsadaq* in the Massoretic text and the Scrolls is then examined, together with that of *dikaioo* in the Septuagint. *hitsdiq* means "acquit" or "vindicate" but never "make righteous." *hitsdiq* is translated by *dikaioo* in the Septuagint. *dikaioo* apparently means "make righteous" in two passages outside the New Testament.

In chapter iii Paul's teaching about justification by faith is expounded. The forensic meaning dominates Paul's use of the term. Justification is conceived as an anticipation of the Last Judgment. The formula "justification by faith" was forged for controversy as a counter-cry to "justification by works." While it by no means contains the whole of Paulinism, it expresses forcefully the basic truth that salvation lies wholly *extra nos*.

In chapter iv Paul's teaching about judgment is expounded and compared with that of Judaism. Paul's attitude to the coming judgment is now optimistic, now pessimistic, but predominantly optimistic. In several passages the fear or threat of judgment is followed by confidence in God's ability to present believers faultless before Himself. In contrast with Judaism, Paul radicalised the thought of the divine judgment. His confidence is due to a new reliance on the grace of God to work in him that which is demanded of him.

In chapter v solutions of the problem which have been proposed in the past are reviewed critically. The author's treatment of the problem owes much to the writings of Braun, Buechsel, Althaus and Joest.

Chapter vi discusses Paul's teaching about election and predestination and their relation to justification.

In chapter vii the motives of Pauline parainesis are

examined. Paul's commonest sanction - the imperative based on an indicative: become what you are - has no exact parallel in Judaism. Paul's teaching about sanctification is then expounded, and, finally, the place of the sanction of judgment in Pauline parainesis is assessed. Whether or not the Last Judgment should be understood as an event - and the author inclines to the view that it should - it is to be taken as a symbol of confrontation with the divine holiness in the most unsparing fashion.

Chapter viii summarises and concludes. The Last Judgment had lost its terrors for Paul for two reasons. First, in his conversion Paul had already had an overwhelming experience of the demand and judgment of God and had not been condemned but accepted. Secondly, ever since his conversion he had had a new awareness of the constraint of the grace of God, transforming him to His likeness. But the Christian may be confident only so long as he recognizes God's absolute claim to obedience and places his hope in God's grace alone. Whenever his converts imagine that they are beyond good and evil or that they are sufficient of themselves to meet God's demands Paul explodes their illusions by preaching judgment by works. But once sober fear has been awakened Paul can utter the word of assurance: God's grace is sufficient to enable you to meet His severest demands. So faith can be born anew. Microfilm \$5.15; Xerox \$18.25. 402 pages.

**NEW ENGLAND COVENANT THEOLOGY:
ITS ENGLISH PRECURSORS
AND EARLY AMERICAN EXPONENTS.**

(L. C. Card No. Mic 60-1257)

William George Wilcox, Ph.D.
Duke University, 1959

Supervisor: H. Shelton Smith

New England Covenant Theology, as presented in the works of William Perkins, John Preston, William Ames, John Cotton, Thomas Hooker, and Peter Bulkeley, was a type of seventeenth century Reformed Theology as conditioned by English life and thought. Although Cotton, Hooker, and Bulkeley immigrated to the New World, while the others remained in the Old, there was a general doctrinal similarity among them.

Based on Biblical exegesis, covenant theology attempted to make the inscrutable will of God more understandable, to erect an orderly world view, and to form the framework for the life of man. To this end a series of covenants was formulated. The first in the series was the covenant of works, under which man in his state of natural perfection with a completely free will was expected to obey the laws of God. However, due to his unique freedom, man made the wrong choices, broke the covenant contract, lost his natural perfection, and fell into original sin. All the descendants of Adam, although the recipients of natural grace at birth, could never hope to fulfill the covenant of works due to this original sin of their fleshly father and spiritual representative. Once man had fallen, God established the covenant of grace which was based on the covenant of redemption already concluded within the Godhead. God made the covenant of grace with Adam, strengthened it through Abraham, and ratified it through Christ, in order to glorify His love and mercy. Thus God ingrafted man into the covenant of grace by enabling him to meet the condition of that covenant, that is, to have faith. In spite of the fact that man was completely dependent on the grace of God, he was not passive. He was expected to cooperate with God in working out his salvation. The purposeful activity of man is a theme of great importance.

The church covenant proved to be the crucial doctrine and the focal point of controversy in New England. The elect were to covenant with one another to form the local particular church. There was to be no other type of church, that is, no regional or national church. The minister was ordained by the local church, and he administered the sacraments which were necessary to the well-being of the church. The fact that all the children of church members were baptized but did not enter the church covenant created a division of church members into two types, unregenerate and communicating. This division aggravated the situation in New England, for under the civil covenant, the prerequisite for enfranchisement was usually communicant membership in a local church. With this suffrage qualification, the church and state developed a close working relationship, although they maintained a theoretical separation. Furthermore, a friendly magistrate was essential to the well-being of the church, for by definition he was a "nursing father." Secular government was provided through the civil covenant, which completed the New England covenant system.

Microfilm \$4.75; Xerox \$16.90. 372 pages.

SOCIAL PSYCHOLOGY

A STUDY OF THE RELATIONSHIP OF THE NEEDS FOR BELONGING AND CONFORMITY TO RELIGIOUS BELIEFS AND VALUES IN A CHRISTIAN COLLEGE

(L. C. Card No. Mic 60-1103)

Paul Friesen Barkman, Ph.D.
New York University, 1959

This study undertook to discover whether the students in an orthodox, evangelical Christian college followed the commonly reported trend toward less supernaturalistic religious beliefs and more secular values with advanced grade in school. It also studied how the students' needs for conformity and belonging were related to the degree of their adherence to the religious beliefs and values of their peers.

The Allport-Vernon Study of Values and an Inventory of Religious Beliefs were used to measure the religious motivation and beliefs of all students at Taylor University at the opening of the fall term, 1958. Freshmen and seniors also took the Edwards Personal Preference Schedule; of which the variables "deference," "autonomy," and "affiliation" were used as measures of the needs for conformity and belonging.

There was no indication that Taylor seniors were lower in religious motivation than freshmen, or that they were less inclined to accept the evangelical doctrines of sin, God, the Bible, Christ, and the hereafter. Seniors appeared to have higher religious motivation than freshmen and be more orthodox in their beliefs. The difference in motivation was generally not statistically significant but the difference in doctrine was generally significant.

There was no indication that the more religious students had greater needs for conformity or belonging than the less religious students. There was a general trend toward less need for conformity to be associated with greater religiosity, although the correlations were not uniformly significant.

All grades of Taylor students ranked so high on both measures of religiosity that the distributions were extremely skewed and the statistics did not seem to adequately represent the upper ranges.

Those who ranked highest on one religion measure usually also ranked highest on the other. Rural students were less religious than urban students. Academic major was not clearly related to rank on religiosity, but occupational plan was. No clearly recognizable relationship appeared between religiosity and socio-economic class, denomination, or the kind of degree the student sought. Other relationships were studied.

Student leaders were not more religious as a group than the average of their grade. This seemed to indicate that student leaders were not primarily responsible for the fact that seniors were more religious than freshmen.

A study of dropouts and transfers suggested that the

difference between freshmen and seniors on religious motivation, need for affiliation, and need for deference probably was the result of selective factors and did not represent change in the individuals. There was reason to believe that the seniors had changed toward more orthodox beliefs and toward greater need for autonomy--less need for conformity to the group.

Microfilm \$2.50; Xerox \$7.80. 170 pages.

CONSENSUS OF ROLE PERCEPTIONS IN A WELFARE PLANNING COUNCIL

(L. C. Card No. Mic 60-555)

Paul McCoy Berry, Ph.D.
University of Southern California, 1960

Chairman: Professor Neumeyer

The study examines the role perceptions of the professional and lay delegates to the St. Paul (Minnesota) Case Work Council. Each delegate was asked to perceive his personal and categorical roles and to estimate the perceptions which the other incumbents would probably have of their roles. The three categorical roles are Social Worker, Staff, and Layman. Delegates were divided into three groupings of role judges: social workers with M.S.W. degrees, social workers without such degrees, and laymen.

Although no sharp division of labor prevails in the Council, it was hypothesized that roles would be both perceived and anchored differently, some of the major variables being length of time in the Council, kind and amount of professional training, extent of role involvement, stated role clarity, and role satisfaction.

The principal instrument of research was a questionnaire, the core of which was a set of role-cue statements reflecting council functions, policies, and simulated situations. Respondents were asked to attach these statements to the appropriate role as they perceived it. Interviews were used to explore role perception anchorages.

Modal patterns were constructed for each categorical role by weighting questionnaire items according to the degree of consensus shown by role incumbents. An index was constructed to measure role involvement. Role satisfaction was judged by the respondent in comparison with his "most satisfying" civic activity. Out-of-council influences on role perceptions were explored.

Findings. (1) Length of time in the Council did not prove to be an important variable in role perception. (2) Role consensus was highest among the social workers with master's degrees, somewhat less among those without master's degrees, and least among the laymen. (3) "Good role perceivers" (those approximating the modal pattern) of the role of incumbency tended to be good role perceivers

of the "other" roles. (4) Role involvement was greatest among the master's group, it was least among the laymen, and the nonmaster's group approximated the lay pattern. (5) Social workers tended to anchor their perceptions of the social worker, the staff, and their own (personal) roles in the "professional orientation" syndrome, whereas laymen anchored perceptions of the lay role in the "broader societal orientation" and their own (personal) role in the "intra-council orientation." (6) The staff role was perceived by all as the most highly structured and the lay role as the least well structured. (7) Role involvement was not significantly related to stated role clarity, satisfaction, consensus, or council interest. (8) Consensus and stated clarity were not significantly related. (9) All role judges differentiated between their own (personal) role and the categorical role in which they had their incumbency (most noticeable among laymen). (10) The role being perceived, rather than the type of role judge doing the perceiving, is the more significant factor. Roles that are well structured were seen to be so by all role judges.

Perceptions of community organization as expressed in selected questionnaire items were classified by four orientation axes: reform, supervisory, planning, and process. Microfilm \$3.20; Xerox \$11.25. 247 pages.

RELATION OF STATUS TO ATTITUDES AND PERCEPTION OF ATTITUDES TOWARD PROBATION: A SOCIAL PSYCHOLOGICAL STUDY OF ATTITUDES, PERCEPTIONS, AND PERCEPTUAL ACCURACY OF JUDGES, PROBATION OFFICERS, AND PROBATIONERS.

(L. C. Card No. Mic 59-6326)

Donald Stanford Dushkind, Ph.D.
New York University, 1959

Adviser: Professor John H. Mann

Probation as a social system has been described with particular reference to its operation in nine criminal courts in New York City. The statuses of the judge, the probation officer, and the probationer of these courts have been described in detail. Previous studies have been cited preparatory to the formulation of certain hypotheses regarding the relation of status in the social system of probation to: (1) attitudes toward probation; (2) perception of such attitudes; and (3) accuracy of such perception. A questionnaire was issued to all the judges and probation officers of these courts and as many of the probationers of these courts as possible. The 4 responses to each of 20 items of the questionnaire by 20 male respondents in each of the three statuses have been analyzed quantitatively relative to their bearing on the hypotheses. The conclusions are as follows:

1. Persons in different statuses within the social system of probation tend to have different attitudes toward some aspects of probation.
2. The status-holders in probation tend to perceive that persons in different statuses tend to have different attitudes toward some aspects of probation.

3. Persons in each status in probation tend to perceive the attitudes of persons in certain statuses more accurately than they do the attitudes of persons in other statuses.

a. Persons in the same status in probation tend to perceive each others' attitudes more accurately than they do the attitudes of persons in different statuses.

4. The relative level of the perceiver's status in probation does not tend in itself to be related to relative accuracy of perception of the attitudes of the other status-holders.

Microfilm \$2.50; Xerox \$6.80. 142 pages.

THE EFFECTS OF ANCHORING ON LATER SOCIAL JUDGMENTS

(L. C. Card No. Mic 59-6327)

J. David Edelstein, Ph.D.
New York University, 1959

Adviser: Professor Lawrence Karlin

PROBLEM

In George H. Mead's view of the communication process, one responds to one's own verbalizations through implicit symbolic representations of the social meaning of the language expressed. The experiment was considered relevant to the proposition that one's implicit responses to one's own verbalizations, when these do not represent one's views, cause opinion changes in the direction of the accepted social meaning of the language expressed. It was believed that this influence could operate even in the absence of factors such as social pressure, reward, convincing argument, or contradiction between one's private opinion and public behavior. More specifically, the experiment was designed to determine whether judgmental anchoring could affect later (post-anchored) judgments and related opinions. An attempt was made to determine the post-anchored effects of a scale value arbitrarily assigned to an anchor stimulus over and above the effects of the anchor stimulus itself.

EXPERIMENTAL DESIGN

The experiment was conducted within the context of a purported survey of opinion regarding the standard terms of imprisonment appropriate for typical instances of stated crimes. Students at a business college were asked to list in questionnaires the penalties they advocated so that their opinions could be made known to legislators, lawyers and judges. Terms of imprisonment were to be listed in years, months, days, or other units of time. This scale was chosen because of its accepted meaning outside the experimental situation.

A control group and five anchored groups were used in the experiment. Three kinds of anchored situations were represented, each preceded and followed by unanchored judgments.

The first anchored group judged a middle list of crimes

with a scale value of only ten years imprisonment arbitrarily assigned by the questionnaire to an extreme anchor crime. This was done ostensibly to overcome the difficulty in obtaining "a true relation among the various offenses" due to "everyone... using a different measuring stick." This group made ten anchored judgments.

The second anchored group was similarly anchored but made only three anchored judgments. It was included to show to what extent practice under anchoring was necessary to affect post-anchored judgments.

The third anchored group supplied their own penalty to the extreme anchor crime before judging the other crimes on the middle list. The subjects were asked to compare the other crimes to the anchor before making their judgments. This group was included primarily as a control for the first and second anchored groups. Post-anchored effects for the first and second anchored groups over and above the effects for the third anchored group could then be attributed to the arbitrary language of judgment.

The two remaining experimental groups had questionnaires similar to that of the first anchored group, but with the three lists of items rotated so that pre-anchored, anchored, and post-anchored judgments were available for the same items. It was expected that the stimuli would contrast differently with the extreme anchor crime, and that this would disturb the relationship among judgment means similarly both during and after anchoring. A finding of this nature would be taken as indicating changes in underlying responses to specific stimuli, as opposed to an overall trend toward lower post-anchored judgments.

RESULTS

Post-anchored judgments of the second anchored group on the time of imprisonment scale were significantly lower than final judgments of the control group. Statistically significant results were not obtained for the first anchored group. The third anchored group (which supplied its own scale values to the anchor) was virtually the same as the control group in the proportion of subjects making final judgments lower than would have been expected on the basis of their initial judgments. This group was also virtually unaffected by the anchor under its anchored condition.

The groups were also compared on post-anchored judgments on a non-numerical scale concerning the leniency or severity of judges. The first and second anchored groups, both of which made anchored judgments under an assigned scale value, were combined for a comparison with a combination of the control group and the third anchored group. These two sets of combined groups differed significantly in their ratings, the direction being consistent with the hypotheses.

Post-anchored judgments on the time of imprisonment scale were obtained from two to thirty-one days later through the use of a mail questionnaire. The results indicated a fading of the effects on post-anchored judgments with the passage of time. This in itself seemed to indicate the presence of post-anchored effects two or more days after anchoring. The finding of a fading of post-anchored effects, although statistically significant, was based on only a small, self-selected sample of respondents.

No disturbance of relationship among post-anchored judgment means (as compared to final means of the control group) was found, perhaps because the declines in these means were relatively small.

CONCLUSIONS

The results indicated that moderately reliable terms of imprisonment advocated for crimes can remain significantly lowered after the explicit removal of an anchor with an arbitrarily low supplied scale value.

The supplied scale value for the anchor was shown to be the key factor in lowering post-anchored judgments. A group which supplied its own scale values for the anchor showed virtually no post-anchored effects.

The results were explained in terms of an unconscious change in attitude, through an association of the general social meanings and implications of the lowered anchored judgments with the general class of stimuli. The writer believes that the findings may be generalized to many social situations where individuals alter their customary judgments, even if only to communicate with others on their terms. Microfilm \$2.50; Xerox \$6.60. 136 pages.

PARENT DECISION MAKING UNDER ASSUMED CONDITIONS OF RISK: THE APPLICABILITY OF DECISION THEORY MODELS.

(L. C. Card No. Mic 59-6330)

David C. Glass, Ph.D.
New York University, 1959

Adviser: Dr. Orville G. Brim, Jr.

The purpose of this study was to test the applicability of the expected utility maximization model to child-rearing decisions by parents. This model derives from utility theory and is concerned with the prediction of what is generally termed individual decisions under conditions of risk; i.e., the selection of alternative courses of action, the outcomes of which have probabilities of occurrence between zero and one.

A second major purpose of this study was to discover personal, social, and situational correlates of individual differences in the rationality of child-rearing decisions. This problem was suggested by the often-noted observation of substantial variations in the manner in which individuals reach decisions. It was hypothesized, therefore, that these differences were attributable to the personality and social characteristics of the subject, as well as the nature of the decision situation confronting them.

The expected utility maximization model states that individuals select a course of action from a set of alternatives involving risky outcomes as if they were attempting to maximize expected utility. This index (i.e., expected utility) is a function of the sum of the products of subjective probability and utility associated with each outcome resulting from a given course of action. Both variables are assumed to exist at the level of interval scale, but in the present study they were recovered only at the level of ordinal scale.

Along with applying this model to the prediction of child-rearing decisions by parents, an attempt was made to extend the theory to rankings of alternatives made by the subjects. It was hypothesized that parents would rank a set of child-rearing alternatives in a descending order of

magnitude of expected utility; i.e., the alternative with the highest expected utility would be assigned the first rank, the one with the next highest alternative would be assigned the second rank, and so on throughout the entire set of alternatives.

In addition to testing the applicability of the expected utility maximization model to child-rearing decisions, an effort was made to determine the relative predictive power of three other "models": (1) an expected utility maximization model corrected for the time at which the outcomes were perceived to occur; (2) a model based only on the concept of subjective probability; and (3) a model which used only the concept of utility (desirability).

A field study was designed in which a self-administering, paper-and-pencil test describing four child-rearing problems was presented to the parent-subjects. The four decision situations each concerned ten-year old sons and represented an instance of deviation from commonly held socialization norms. They were: masturbation, refusal to do homework, disobedience, and petty stealing. In each instance, the subject was presented not only with a description of the situation, but with six courses of action which might be taken. The subject was then asked to list the outcomes of each action, their utility (i.e., desirability), their probability of occurrence, and the time at which the subject believed they would occur. Following this, he was asked to state the action or actions he would select for performance, as well as to rank the six alternatives in preferential order.

Since it was decided that it would be profitable to view rationality in terms of the degree of agreement between a subject's actual rank order of alternatives and that based on expected utility, an agreement score (i.e., S , the numerator in Kendall's τ), was computed for each subject. These S -scores were presumed to represent the subject's degree of rationality, and thus were correlated with the personal and social variables used in the study.

The personality tests consisted of measures of the following variables: manifest anxiety (e.g., the Taylor A-scale); cognitive values such as optimism, belief in fate, future time orientation, and the like; a set of personality traits including self-confidence, independence of judgment, and emotionality; a standard measure of verbal intelligence; and three parental attitudes -- dominance, rejection, and relative ascendancy of husband and wife. The social variables were sex, age, religion, education, and occupation.

The subjects were 48 couples who had a son in either the fourth, fifth, or sixth grade of a selected New York City public school. They were predominantly upper middle-class, Jewish, and all were white.

The results showed that the expected utility maximization model predicted the child-rearing decisions substantially better than chance ($p < .05$). Similarly, the models based on utility and expected utility corrected for time also predicted at better than chance level. On the other hand, the model using only subjective probability failed to predict choices successfully.

With regard to prediction of the rank order of child-rearing alternatives, the results appeared to duplicate those found in connection with the choice of alternatives. Thus, the distributions of S -scores for each of the models, excepting the one based on subjective probability, were significantly different from what would be expected under the null hypothesis.

A comparison of the relative predictive power of the four models revealed that the expected utility maximization model, the expected utility maximization model corrected for time, and the model based on utility alone were equally successful in predicting the decisions of the subjects. The subjective probability model, on the other hand, was clearly inferior to the other three.

An examination of the data bearing on the comparative accuracy of the four models for predicting the rank order of child-rearing alternatives indicated that the expected utility maximization model and the expected utility maximization model corrected for time were equally successful, while the models based on utility alone and subjective probability alone were clearly inferior predictors. However, the utility model was better able to predict the rankings than the model based on subjective probability.

All findings reported above occurred in both the male and female data.

Turning to the evidence pertaining to personal, social, and situational correlates of rationality in child-rearing decisions, the principal results indicate that personality variables play a relatively minor role in accounting for individual differences in rationality. However, certain notable exceptions were discovered. Employing the product moment method of correlation, the following variables revealed significant positive relations ($r = \pm .285$, $p \leq .05$) with one or more of the S -scores: independence of judgment, future time orientation, verbal intelligence, and belief in trying many courses of action. These results were better defined for the male subjects. Conversely, the following variables showed significant negative relations to one or more of the S -scores: belief in thinking before acting, self-confidence, self-sufficiency, dominance, and rejection. These relations were better defined in the female data.

Among the social variables, age was found to be negatively related to the S -score for the masturbation situation in the male and female data, while being non-Jewish revealed a positive relation with the same S -score in the male data only. No other significant correlations were discovered.

The evidence revealed certain situational differences among the personal and social correlates of rationality. In particular, the masturbation decision situation appeared to result in a different pattern of correlations from the other three situations; e.g., independence of judgment and age showed significant positive and negative correlations respectively, with the masturbation S -score.

The foregoing data was subjected to further treatment by the complete centroid method of factor analysis. This analysis was performed separately for males and females. Of the factors extracted, twelve were retained for rotation in the male data, and eleven in the female data. Rotation was by Quartimax. The factor structure for the male data revealed, among others, a bipolar factor tentatively identified as "Fate vs. Rational Autonomy", in which the masturbation S -score was loaded. In both the male and female data, the rationality measures were found to load orthogonal factors, although only three of these scores (masturbation, obedience, and stealing) loaded factors containing an appreciable number of personal and social variables.

While there were several differences in the factor structures of the husbands and wives, from a factorial viewpoint, the same orthogonal factors were generally found. Among the better defined sex differences was the

finding that the opposite pole of the female fate factor appeared to be self-sufficiency rather than rational autonomy as in the case of the males.

Having completed the factor analytic treatment of the data, an attempt was made to construct factor scores for the prediction of the S-scores. Inasmuch as some of the factors were not sufficiently well defined to warrant the construction of such scores (even after rotation through the criterion S-scores), it was possible to build only four factor scores. Two corresponded to the male S-scores for masturbation and obedience, and two were constructed to predict the female S-scores for masturbation and stealing. Since the female S-score for obedience persisted in loading the same factor as the S-score for masturbation, it was decided that the factor score designed to predict the latter should also be correlated with the obedience S-score.

All of the factor scores yielded predictions of corresponding S-scores which exceeded in absolute magnitude the size of the product-moment correlation coefficients which were obtained by correlating any one of the constituent items in the factor scores with the appropriate S-score. Thus, the correlations ranged from .23 for the female S-score in the obedience situation to .51 for the male S-score in the masturbation situation, with the median correlation being .45.

On the basis of the over-all findings pertaining to correlates of rationality in child-rearing decisions, it is concluded that a useful model of such choice behavior should include some formulation of the effects of personal, social, situational variables on utility and subjective probability.

Microfilm \$9.75; Xerox \$34.80. 772 pages.

EFFECTS OF INFORMATION ABOUT GROUP DESIRE FOR CHANGE ON MEMBERS OF A GROUP

(L. C. Card No. Mic 59-3442)

Gordon L. Lipplitt, Ph.D.
The American University, 1959

General Statement of the Problem

In the last few years the social psychologist has been increasingly aware and interested in the forces in groups that cause individual behavior to change. There has been a great deal written about the induction of influence from others in a group. Such "feedback" from others takes place in numerous ways--social expression, accepting or rejecting behavior by other group members, and in numerous other types of influence attempts. Former studies have tended to neglect the effect of direct giving of information to a group member, by a person outside the group, as to how the group would like a particular group member to change his behavior. This study, carried on with two group populations, tests whether communication from other people about oneself can become an important force for change when they are depersonalized and made explicit.

General Plan of the Study

This study attempts to explore the effect of an information giving interview to an individual about how his behavior is perceived by others in the group and what the

desires are for changes in this group member's behavior by the group.

This study was conducted on two training groups of 18 members each at the 1949 summer session of the National Training Laboratory in Group Development, at Bethel, Maine. Members of these groups were adults from various vocations and professions who were attending a human relations training program.

Each member of these two groups made judgments about each of the other members on three dimensions of group behavior: (1) frequency of participation in group discussion, (2) the degree to which he welcomed or resisted the ideas of others, and (3) the extent to which he sought attention or avoided recognition in the group. In addition to placing each fellow member on these three scales, the rater drew an arrow indicating the direction and amount of change he wished each of his fellow members would make in their group behavior on each of the three scales. Seven matched pairs of members were then selected from each group. The pairs were matched on the extent of the group's desire to see them change. One member of each pair was randomly selected as an experimental subject to whom a feedback of information about the group's perception of him would be given in a fact giving interview midway through the life of the group, while the control member of each pair would receive no such information. Prior to the feedback interviews, trained observers spent five days observing in each group to get objective behavior data about each member on each of the three dimensions of group behavior. In the information giving interview, each experimental subject received group tabulation data. After all the feedback interviews had been completed, the observers again made objective observations of behavior in the group for five days. At the end of this period the total group again filled out rating forms at the end of their sessions, indicating where they perceived each fellow member to be on the three scales and any change that had taken place.

Conclusions

1. Evidence has been presented to show that a feedback interview during the life of a T-Group on how group members desire change does affect change in the individual to whom this data is presented.
2. Judgment about group members need for change is differentiated from choice of friends in the groups studied.
3. The factor of group attractiveness is not as important a force for motivating change in the T-Group as is the giving of information about group desire for change to the individual.
4. The factor of individual desire for change is not as important a force for motivating change in the T-Group as is the information giving interviews of others desire for change in the individual.
5. If an individual feels that the information given to him in the information giving interview is helpful, it will motivate him to change even more in his group behavior.

Microfilm \$2.50; Xerox \$8.20. 179 pages.

ON THE DEVELOPMENT OF GUILT-RESPONSE SYSTEMS

(L. C. Card No. Mic 60-889)

Sanford Martin Unger, Ph.D.
Cornell University, 1960

In this work, the body of extant research results on guilt-response learning is theoretically integrated, and a number of relationships which have previously appeared in separate studies are confirmed.

Two "dimensions" of developed guilt-response systems are independently indexed: 1) transgression-instigated guilt-response potential, by means of a projective measure; and 2) the pervasiveness of guilt-anxiety, by an adaptation of the Children's Anxiety Scale. These two foci are then separately considered vis-a-vis their antecedents. Three hundred and twenty-eight sixth-grade children served as subjects; the children were also the source of information about their parents' behavior.

An inclusive hypothesis that prepotent guilt-response potential, contingent on transgression, varies as a joint function of the nurturant significance and the relative predominance of use by a parent figure of "exclusively dependency threatening" disciplinary techniques is tested and confirmed. The absolute frequency of parental use of "potentially avoidance or aggression arousing" disciplinary techniques is negatively associated with the projective guilt-response scores; the absolute reported frequency of exposure to "exclusively dependency threatening" events -- when other factors are not controlled -- is curvilinearly associated with this measure, i.e., "high" guilt-response scores are associated with a moderate frequency.

The questionnaire scale developed to index the pervasiveness of guilt-anxiety -- in view of its failure to relate to either the projective measure or to an external "validity indicator" -- is highly suspect. However, the analysis of a special sub-sample, children already measured as high in transgression-instigated guilt-response potential, shows pervasive guilt-anxiety to increase as a function of the reported frequency of parental use of "arbitrary, enduring, or unpredictable" disciplinary practices. In addition, partial correlation analysis reveals a positive relation between guilt-anxiety scores and the absolute frequency of parental use of dependency threatening techniques.

Lastly, the joint relation to cheating behavior of a measure of "success" response potential and the projective guilt-response scores is investigated -- utilizing a test situation designed to render "successful" performance impossible through honest effort. A significantly lower frequency of cheating occurs in the group of children manifesting evidence of "high transgression-avoidance potential + low success motivation" than occurs in a contrasting group characterized by "low transgression-avoidance potential + high success motivation."

Microfilm \$2.50; Xerox \$7.40. 159 pages.

BREADTH OF PERSPECTIVE, CULTURE CONTACT, AND SELF.

(L. C. Card No. Mic 60-953)

Leon Harold Warshay, Ph.D.
University of Minnesota, 1959

This study seeks to account for variation in breadth of perspective, the latter defined as the number of different kinds of alternative solutions that one can think of when presented with a problem. It asks, in other words: How can one account for the fact that some people, when faced with a problem situation, are able to call forth a greater variety of responses to that problem (regardless of the response they would finally select, or the one which would work best)?

Assuming that perspective is partly the function of one's social experience, particularly as organized around self, the emphasis has been upon collecting information relevant to this assumption. Hence, the subjects' background and the kind and range of their self identities were explored.

Following from or compatible with the above, six major conditions were hypothesized as positively related to breadth of perspective, of which all but the second were substantiated in varying degrees by the subsequent research. They are:

1. Breadth of culture contact, e.g., spatial mobility, group contact, reading;
2. Habit disruption, e.g., parents died or were divorced, widowhood;
3. Contact with opposing ideas, e.g., in reading, in friendship;
4. Broadness of conception of self;
5. Proportion of non-ascribed identities;
6. Situation-free modal identities.

The second condition above, habit disruption, found no support in the study and, when reformulated, went in a partly opposite direction from that originally predicted.

In addition, other, more peripheral, variables were examined and found to be related. Since the aim of the study is to be extensive and exploratory rather than intensive and definitive, several of the variables found in other researches to be relevant to many aspects of human behavior--such as age, education, social class, and community size--were included.

The sample studied consisted of precinct chairwomen of each of the two major political parties, in Minneapolis. Their selection kept constant sex and avocational role and enabled choice of problems relevant to that role.

Breadth of perspective was measured through the subject's being encouraged to volunteer verbally as many solutions as possible to hypothetical problem situations presented to her during an interview. The problems, selected and ranked as to degree of familiarity by a small sample of St. Paul precinct chairwomen, consisted of six in all, three familiar (from precinct politics) and three unfamiliar (non-political and removed from their usual experience).

To measure the independent variables, the interviewer

collected much background information and also administered the "Who am I?" test.

The conclusions, making use of the findings of both the central and peripheral independent variables, shall now be briefly presented.

Five of the six above-mentioned central independent variables were positively related to perspective breadth as predicted. Habit, disruption, however, showed the following pattern:

1. Childhood disruption was not related at all to perspective breadth;
2. Adult disruption, i.e., widowhood and death of parents during the subject's adulthood, was negatively related to breadth of perspective.

Perspective breadth in unfamiliar situations suffered most from attachment to social contexts, particularly those of the local community, and was broadest with wide contact with the strange and distant.

Perspective breadth in familiar situations, on the other hand, was most narrow for those with a passive relation to their world; it profited most from broad contact with the traditional and near.

Breadth of perspective, as defined above, has not been very directly studied by students of human behavior. The present study has shown it to be related in many ways to several of the more important variables in the social sciences. Microfilm \$3.75; Xerox \$13.05. 290 pages.

BEHAVIOR PATTERNS IN GROUP PSYCHOTHERAPY SESSIONS IN TWO VETERANS ADMINISTRATION HOSPITALS.

(L. C. Card No. Mic 60-1165)

Joan Welkowitz, Ph.D.
Columbia University, 1959

This study of variables related to behavior in psychotherapy groups was carried out at the Veterans Administration hospitals in East Orange, New Jersey, and Lyons, New Jersey.

Group psychotherapy in these hospitals was characterized by: (1) patients who were selected for therapy groups by the hospital staff, (2) patients who came from lower socio-economic classes than patients who attend private therapy groups, (3) patients who interacted on the ward, and (4) some patient turnover at each session.

Basic Design

Three groups of hospitalized psychiatric patients, two of psychotics and one of neurotics, were observed in psychotherapy sessions over four-month periods. Patients' behavior was recorded by an observer using Bales' Interaction Process Analysis procedure. Patients' attitudes toward therapy, their ward interaction rate, and a measure of ego strength (constructed by Barron) were selected as characteristics to be used as the independent variables. These were related to individual behavior in the therapy groups.

Hypotheses

The following hypotheses were tested.

1. Favorable initial attitudes toward psychotherapy are positively correlated with positive reactions in the social-emotional and task areas (as defined by Bales) in group psychotherapy. These areas are labelled, "shows solidarity, shows tension release, agrees, gives suggestion, gives opinion, gives orientation."

2. Individuals' ward interaction rates (based upon summed reports by peers of frequency with which the patients interacted with others on the ward) are positively correlated with total interaction in the group situation and with the amount of action directed toward other group members.

3a. A weighted combination of scores based upon ward interaction and attitudes toward psychotherapy is positively correlated with interaction rates in group therapy. The combination score is positively correlated with reaction in the following positive social-emotional and task areas:

- a. "gives opinion, suggestion, orientation"
- b. "shows solidarity, tension release"
- c. "agrees."

This score is also positively correlated with action directed to the patient from other group members and also with the amount of interaction directed toward other group members.

3b. The combination score is negatively correlated with the amount of action directed toward the therapist and also negatively correlated with the amount of interaction in the negative social-emotional area, "shows tension, antagonism, disagrees."

4. High ego strength is positively correlated with both favorable attitudes toward psychotherapy and sociability on the ward. Predictions as to its relationship to behavior in psychotherapy are restricted to changes in individual behavior: it being hypothesized that individuals high in ego strength change to more positive kinds of interpersonal behavior when initial attitudes and sociability are held constant as contrasted with those low in ego strength.

Results and Contributions of Study

(1) The hypothesized relationships among attitudes toward therapy, sociability, ego strength, and interaction in group therapy were statistically significant for groups of psychotic patients and some of the relationships were also significant for the neurotic group.

(2) An extremely high stability in the patterns of interaction within the therapy groups was indicated. This stability was true for both the psychotic and neurotic subjects.

(3) Initial attitudes toward psychotherapy and behavior on the ward were shown to be related to behavior in the therapy groups.

(4) Differences were noted between the psychotic and neurotic groups, the behavior of psychotic patients being more predictable in terms of the Bales categories.

Consistency in individual behavior over time in the group psychotherapy sessions was very marked. It was found that measures of attitude toward therapy, ego strength, and behavior on the ward were significantly

correlated with these subsequent measures of behavior in the therapy groups.

Aside from lending support to the hypothesized relations, such findings suggest that it is feasible to manip-

ulate experimentally the composition of therapy groups in order to make predictions about different types of group interaction.

Microfilm \$2.50; Xerox \$8.40. 182 pages.

SOCILOGY

SOCILOGY, GENERAL

THE LEVEL OF ACCOMMODATION BETWEEN
ORGANIZED RELIGION AND ORGANIZED LABOR
IN AN INDUSTRIAL COMMUNITY

(L. C. Card No. Mic 60-627)

Lilalyce Sink Akers, Ph.D.
University of Kentucky, 1952

The Problem

This study is an approach to the nature of the accommodation that exists between organized religion and organized labor in an industrial society. Accommodation is usually defined as a process through which groups adjust to each other and form working relationships in a given society, and it generally presupposes the existence of conflicting forces, seldom of equal status, to be reconciled. In this study, organized religion, long established and enjoying a respected status, is the superordinate force, while organized labor, a relatively new movement of uncertain status, is the subordinate force.

Because of the size of the field, it was necessary to impose some arbitrary limitations upon the study. First, the study is limited to the present patterns of adjustment between organized religion and organized labor. Second, the study is confined to a single industrial area, the city of Philadelphia. Third, the study is concerned only with the members of the white race in order to eliminate the confusion presented by the interjection of racial issues. Fourth, the study is limited to the accommodation existing between the local leaders of the organizations. The local leadership group was selected because it was the group representative of its organization and suitable in size for a single study.

To ascertain the level of accommodation, the relationships existing between these leaders and the organizations were analyzed. An examination was made of the contacts, attitudes, and background characteristics of the leaders, as was an attempt to learn the relationships between these factors. The study first analyzed the relationships between religious leaders and organized labor, and then the relationships between labor leaders and organized religion.

The Conclusions

The mid-twentieth century patterns of adjustment between organized religion and organized labor at the local

leadership level in Philadelphia can best be described as antagonistic accommodation. Indicative of this adjustment are two aspects of the basic finding made in this study: the existence of a tenuous accommodation, and the antagonistic nature of this accommodation. The two groups involved in this study have developed methods of adjusting to each other in the given community. The fact that overt conflict no longer exists is evidence of this adjustment. The response of organized religion to the need for adjustment has been an attempt at isolation. As the superordinate force, organized religion did not find it necessary to make extensive accommodation. Its adjustment consisted of acknowledging the legitimacy of organized labor, and then seeking to avoid contacts with labor organizations.

On the other hand, organized labor, having the burden of accommodation, has adjusted to the patterns set by organized religion by allowing the pattern of isolation to continue in that labor organizations have not pressed their claims or resorted to coercion with respect to religious groups. In addition, there have been evidences of some cooperation with organized religion by labor leaders. Although religious leaders tried to avoid contact, labor leaders have taken the initiative in promoting contacts, especially personal contacts. All the labor leaders in this study experienced direct contacts with organized religion and most of these leaders had five or six kinds of contacts. Moreover, these contacts were of a more intimate nature than were those of the religious leaders.

In this study an effort has been made to learn what factors might be most closely related to the attempt at accommodation between the two groups. The professional role of the clergy appears to be the most important factor in explaining the extent of contact as well as the kind of attitude the clergy had with respect to organized labor. In spite of wide variations in factors such as age, socioeconomic class, previous employment, or ministerial experience, a consistency in the behavior of the clergy toward organized labor prevailed. The only characteristic the clergy had in common that is related to the pattern of isolation is the professional role they assume upon entering the ministry.

Differences in religious indoctrination appear to be the most important factor in understanding the variations that exist among the attitudes and to an extent the contacts of labor leaders with respect to organized religion. The Catholic labor leaders, whose religion emphasizes the authority of the churches, were the least critical of religious groups, while the Protestant and Jewish labor leaders were more critical.

Microfilm \$4.05; Xerox \$14.20. 314 pages.

THE ROLE OF BUSINESS AND LABOR SPONSORED
FILMS IN EDUCATION:
A STUDY IN MASS PERSUASION.

(L. C. Card No. Mic 60-813)

Donald Auster, Ph.D.
Indiana University, 1959

Business and labor films such as are available for school use were examined from the standpoint of mass persuasion by means of a quantitative content analysis of 1,429 catalogue descriptions of business-sponsored films and 197 catalogue descriptions of labor-sponsored films. These data were supplemented by a random sample of 48 films which were viewed. The viewed sample served as a validity check on the catalogue descriptions and as a source of qualitative information concerning film content. A classification system consisting of ten categories and 24 subcategories reflecting various persuasive techniques was developed and all films were classified under one or more of these headings in accordance with a detailed set of coding instructions. Reliability tests indicated more than 80% agreement between the author and other coders on the classification of films.

The content analysis utilized a "language of power" framework which conceived of business and labor films as complex symbolic forms invoked to justify and maintain power statuses and practices. Its major proposition was that business films would employ "persuasive" propaganda with an emphasis on "ideology" while labor films would stress "agitational" propaganda centering on "utopia." "Persuasive" propaganda employs symbolic rather than operational manipulation of public opinion, while "ideology" can be distinguished from "utopia" by its presentation of ideas and symbols aimed at buttressing rather than transforming the social order.

The focus on the relationship between power and mass persuasion was developed by an analysis of changes which have occurred since the nineteenth century in the institutional power structure, in the role requirements of business and in the socialization process. This analysis and the language of power framework provided the basis for the specific expectations concerning the content characteristics of business and labor-sponsored films.

In general the findings of the study supported the content expectations. They included statistically significant differences in the comparative proportion of business and labor films dealing with political and economic values, controversial issues, the organization and operation of the sponsoring organization, the production process and the promotion of products. Additional findings indicated somewhat greater proportions of business than labor films devoted to education, entertainment, the contributions of the sponsor to society and the attributes of the sponsor. On the other hand, comparatively larger proportions of labor films were devoted to describing benefits to subgroups, the presentation of cherished values and multiple themes. Evaluation of these and other findings suggested the effects of business-sponsored films in providing a mode of adjustment to anomie, in fostering "technicways," in the transferral of charismatic qualities from business leaders to the corporate image, in reinforcing audience tendencies towards self-interest and distrust and in providing "status legends" for the sponsors themselves.

The content findings were also related to a viewing

matrix involving the teacher's role, the structure of the school, the predispositions of audiences and the conditions under which classroom film viewing occurs. It was concluded that the classroom use of business-sponsored films fulfilled three important requirements of effective mass persuasion: "canalization," a monopoly propaganda position and supplementation by face-to-face contact.

The findings and analysis indicated that the sponsored films of both business and labor represented contemporary forms of mass persuasion.

Microfilm \$3.55; Xerox \$12.40. 275 pages.

THE IDEOLOGY OF MOBILITY:
SOME ATTITUDINAL ASPECTS OF MIGRATION.

(L. C. Card No. Mic 60-920)

Robert Edgar Forman, Ph.D.
University of Minnesota, 1959

Although there has been a considerable amount of research dealing with physical mobility, practically all of it has been concerned primarily with simply describing its extent with reference to a particular area and time period, looking for factors associated with migration (selectivity), or comparing patterns of mobility to mathematical models. Common to these approaches is their lack of relationship to general sociological theory. Where mobility is viewed within the frame of reference of sociological theory, it is usually only done so as it relates to other phenomena. This study represents an attempt to consider mobility within the field of general sociology.

Physical mobility has played an important role in Western society in general and our own society in particular. Given this mobility, it is assumed that a set of attitudes, values, and beliefs have developed concerning mobility. This is termed the ideology of mobility, which is studied here through the approval or disapproval of a series of statements justifying mobility by a 1,770 Minnesota high school students.

Mobility is conceived of as resulting from a favorable mobility decision, which is made on the basis of a comparison of the perceived advantages and disadvantages of the present as compared to a potential location, given the person's needs, goals, and aspirations. Individuals, formal and informal groups, and institutions which would be affected by the person's mobility or lack of it would be expected to attempt to influence the mobility decision through compulsion or persuasion. Historical evidence provides a number of examples of such attempts.

The number of justifications for mobility approved is taken as a scale score which is related to other variables. Attitudes towards the community are measured with a Community Satisfaction Scale (CSS). These two scales are not associated with each other statistically. Socioeconomic level is viewed both in terms of status as measured by father's education and occupation, and class as determined by family income.

Both class and status measured are associated with both CSS scores and Mobility Justification Approval (MJA) scores, although MJA scores seem to be more closely associated with status and CSS scores with class. Necessity to move to get a desired job is negatively associated with

class but not with status. Lack of attachment to area is positively associated with status but not class. Expectation of mobility is strongly related to community satisfaction. Greater mobility experience by the respondents is associated with higher MJA scores.

When considering conditions which might keep them in the community or make them move, respondents' answers appeared to be determined not by the conditions themselves, but by their mobility attitudes and community satisfaction.

It is concluded that there is a considerable range of attitudes relating to mobility, and that favorable attitudes are closely associated with middle class values. It is thought that this may be attributed to the role mobility may play in the socioeconomic advancement of the individual in accordance with middle class values.

Microfilm \$3.70; Xerox \$12.85. 285 pages.

WESTERN PENITENTIARY: A STUDY IN SOCIAL ORGANIZATION.

(L. C. Card No. Mic 60-856)

Peter George Garabedian, Ph.D.
University of Washington, 1959

Chairman: Clarence C. Schrag

The present study represents an initial attempt to study objectively the relationship of social organization and attitudes in a correctional setting. Major criterion variables used are (1) the normative system of inmates, (2) inmate informal organization, (3) inmate knowledge of prison argot, and (4) staff attitudes toward correctional goals and programs. Variations in each of these variables are accounted for in terms of background characteristics and social experience, social position in the organizational structure of the prison, and experiences within the institution. In addition, the study examines staff and inmate attitudes towards a spontaneously established inmate-managed therapy group that was recently activated within the penitentiary. Reactions to this group are analyzed in terms of the variables listed above.

Data for this investigation were collected by means of questionnaires administered to a sample of inmates and a sample of staff members. The inmate sample was selected by random sampling procedures, while staff members who were present at the monthly in-service training session at the penitentiary were included in the study.

The major findings of the study are as follows:

First, little consensus is found to exist among institution staff members as to the importance of correctional goals. Endorsement of goals by staff members is found to be associated with their background characteristics and their positions in the organizational structure. In addition, staff confidence in treatment programs varies with social position and experience in the institution. Endorsement of the treatment goal and confidence in treatment programs are found to operate independently.

Second, inmates are found to differ not only from staff members in their value orientations, but also among themselves. Those inmates who have not had an extensive

criminal career are more conventional in their values than inmates who have had extensive criminal careers. Value orientations are also found to be closely associated with social position and experience of inmates in the institution.

Third, using Schrag's theory of social types, 73 percent of the inmate sample is classified into one of five major social roles. Criminal career characteristics of inmates playing each of these roles are found to vary systematically and validate the existence of social types as conceptualized by Schrag. In addition, the institutional performance, interactive output, and value orientations of each social type are found to vary systematically in the predicted direction.

Fourth, the inmate's knowledge of prison argot is used as an indirect measure of the extent of his involvement in the prison community. It is found that degree of involvement can be predicted by the use of criminal career characteristics, institutional experiences, and social types. It is also found that members of each social type acquire the argot at differing rates of speed.

Fifth, inmates who are members of the therapy group studied differ systematically from inmates in the general population. Inmate communication and attitudes toward the group vary with institutional experience, degree of involvement, and position in the informal social structure. Staff communication and attitudes toward the group vary with attitudes toward correctional goals and programs, and position in the organizational structure.

The findings listed above suggest that much of individual behavior can be accounted for in terms of the social organization of which the individual is part. It is hoped that they may have some practical value in aiding prison administrators who are involved in making policy decisions concerning the operation of correctional institutions. Moreover, the findings raise questions that are not answered in this study and are listed in the final chapter as suggestions for future research.

Microfilm \$3.10; Xerox \$10.80. 240 pages.

A STUDY OF TURKISH VALUES BY MEANS OF NATIONALITY STEREOTYPES

(L. C. Card No. Mic 60-926)

George Clifford Helling, Ph.D.
University of Minnesota, 1959

Problem

To discover actual values of present day Turks as a people evidently undergoing profound cultural change with relatively few social problems.

Theory and Definitions

A general theory of social problems (e.g., Rose, 1956) which posits communication breakdown as a fundamental precondition both to social disorganization (lack of common meanings) and conflict (value clashes) centers attention on shared meanings and values in the Turkish language.

Values are defined as (1) the connotations of approval, importance, and evaluativeness (as against descriptiveness) that a particular word carries in addition to its

denotative meaning, and (2) the acceptance or rejection of a particular human "image" as a model for behavior.

Samples

- (1) Pretest (open-ended description) - 43 Turkish respondents, students* and teachers from Gaziantep, Izmir, and Ankara.
- (2) Stereotypes test (the basic study of values) based on Katz and Braly (1933) - 347 male, 84 female students* from rural, town, and city schools.
- (3) Nationality ranking test - 120 male, 57 female students*.
- (4) "Authoritarian Personality" projective test (from Adorno et. al., 1950) - 101 males, 23 females, variety of ages and backgrounds.

Method

Respondents (2 above) described sixteen nationalities from a list of one hundred "most frequently used" Turkish adjectives obtained from the pretest. Other respondents (3 above) ranked the nationalities from most to least liked. Adjectives were then categorized on the bases of total frequency of use (salience or "importance"), whether they were used preponderantly for liked or disliked nationalities (valence), and whether they were used only for liked or for disliked or for both (evaluative focus or evaluativeness-descriptiveness). This disguised test served to circumvent respondent resistance and to require actual value choices (rather than value statements). The Irish provided a "natural" cutting point between favorably and unfavorably perceived nationalities as the point of minimum affect indicated by smallest number of adjectives applied. The applications of the 100 words to 16 nationalities (45,613 applications) were correlated with six salient adjectives sharply focused at different levels of favorableness to obtain six adjective clusters.

Results (basic study)

The nationalities were ranked in the following order: (1) Turks (most liked), (2) Germans, (3) Americans, (4) Swiss, (5) Japanese, (6) English, (7) French, (8) Irish, (9) Italians, (10) Arabs, (11) Negros, (12) Jews, (13) Chinese, (14) Armenians, (15) Greeks, (16) and Russians (least liked). Verbal stereotypes for each are presented.

The 100 adjectives appeared much more evaluative than descriptive with a strong tendency for words of sharper evaluative focus also to be of higher salience. In general the results show Turkey to be a "loyalty culture," stressing virtues of courage, steadfastness, military heroism, with a secondary place given to the refinements of civilized living. This result emerged more clearly in the six word clusters which seemed to be latently integrated as cognitive images of men against which Turks measure other nationalities. These images were termed the "soldier-hero," the "civilized gentleman," (favorable), the "bazaar merchant," the "backward peasant" (mildly unfavorable), and the "enemy within" and the "enemy without" (highly unfavorable).

Results (validation studies)

Direct ranking of the adjectives and content analysis of schoolbooks in general confirmed the basic study. Adjective valences assigned by population subgroups (categories on basis of sex, rural-urban residence, social status, occupation of father) showed Turkish values to be highly unitary. Lastly the projective test of personality revealed twice the number of "high" ethnocentric ("Authoritarian") type responses as would be expected in a random American sample.

Conclusions

Qualified conclusions as to the stabilizing effect of unified, authoritarian values stressing the military virtues on Turkish stability are drawn.

Microfilm \$6.80; Xerox \$24.10. 534 pages.

RESIDENT ADJUSTMENT PATTERNS IN THE RURAL-URBAN FRINGE

(L. C. Card No. Mic 59-2637)

Richard Allen Kurtz, Ph.D.
Michigan State University, 1959

Recent information has suggested that the traditional description of urban social life, which emphasizes the lack of cohesive and informally organized interaction patterns, must be questioned. Since investigators in the rural-urban fringe area have reached conclusions which parallel the urban stereotype the possibility exists that this view is also distorted. Therefore, the present study was addressed to an empirical analysis of social life in the fringe area.

The study site chosen for analysis was the fringe area surrounding Lansing, a typical industrial city of the North Central States. A random sample of residents was drawn, representing farmers, part-time farmers, and nonfarmers. A battery of questions was submitted to sample members by utilizing a field schedule.

Questions were directed to two dimensions: 1) participation patterns in the area, and 2) identifications with the area. The first variable was termed "objective integration" and the latter, "subjective identification." By utilizing scalogram analysis an integration scale, composed of four questions, was derived. Scalogram techniques were not successful for the identification dimension, nor was the method of summated ratings. The failure of scaling methods created a need for a totally new approach to the analysis of identification. Therefore, typologies based on the direction, content, and depth of identification were constructed.

Frequency distributions of both the integration scale and the identification typologies suggest that the conclusions of investigators who described the fringe area as an "institutional desert" cannot be accepted. Over forty percent of the respondents exhibit high participation patterns and more than ninety percent may be classified as positively identified with the area. It is suggested that the discrepancy is a result of the fact that previous investigators conducted their research in areas which are more clearly

suburban than fringe and, in addition, that sociologists working in areas surrounding central cities have usually concentrated on newcomers, while ignoring long-time residents.

Having established the existence of both integration and identification, the study was focused on attempting to account for differentials. It was ascertained that long-time residence, relative stability, rural and non-Lansing background, and commitment to the area are all associated with a high degree of within-area participation. Direction of identification could not be accounted for but it was found that both content and depth are associated with the same general variables as is integration.

In addition to accounting for adjustment the study was addressed to determining the influence of integration and identification on community orientations. It was found that definitions of the area, as either rural or urban, are affected by adjustment. Respondents who exhibit high degrees of integration, whose identifications with the area are based on friendship patterns and familiarity with it, and who had no prior choice for living in the area, define their place of residence as rural, rather than urban.

The data suggest that patterns of integration and identification do exist in the fringe, and that these are influenced by the residential experiences of residents and by commitment to the area. In addition, adjustment patterns affect some community orientations.

Microfilm \$3.45; Xerox \$11.95. 265 pages.

A PROBABILITY MODEL FOR SOCIAL INTERACTION

(L. C. Card No. Mic 60-1009)

Robert Kendric Leik, Ph.D.
The University of Wisconsin, 1960

Supervisor: Associate Professor Robert McGinnis

This thesis consists of a report of the development and preliminary testing of a model for predicting initiation and distribution probabilities of action in small groups. The model is generalized to a probabilistic social action theory of essentially Parsonian nature.

Assumptions of the model express probabilities of initiating and receiving acts in terms of general probabilities of the actors. The distribution of acts, given the initiation and reception probabilities, is hypothesized to be an independent function of these probabilities. The necessary equations for computing theoretical interaction frequencies in a matrix with zero diagonal elements are derived.

Testing of the hypothesized relationships consists of analysis of data from 28 experimental discussion groups. Each group consisted of three subjects, the experimental design permuting subjects in successive experiments so that each actor interacted with others of varying levels of initiation and reception.

Results support in whole or in part the hypotheses of the model. Insufficient data precluded adequate mathematical treatment of probabilities of receiving action.

Microfilm \$2.50; Xerox \$4.20. 78 pages.

A STUDY OF TEEN-AGE SOCIALIZATION AND DELINQUENCY INSULATION BY GRADE LEVELS

(L. C. Card No. Mic 60-1198)

Edwin Lowe Lively, Ph.D.
The Ohio State University, 1959

One of the crucial issues in the fields of criminology and juvenile delinquency is the question of why some persons are receptive to anti-social norms and others reject them. A recent approach to this problem is that of Walter Reckless and Simon Dinitz of the Sociology Department of the Ohio State University. In a series of studies, they investigated the relationships between socialization, self concepts, and insulation against or vulnerability toward delinquency. Based on responses from twelve-year-olds (sixth-graders) who represent the threshold age of delinquency, the Reckless-Dinitz studies indicated that differential socialization has produced differential self concepts for a number of subgroups at the sixth-grade level, and that these differentiated response patterns result in varying degrees of insulation against delinquent behavior.

The dissertation reviews research designed to measure the impact of advancing age on socialization and self concepts of the various subgroups at the sixth-, seventh-, eighth-, and ninth-grade levels. Three general hypotheses postulate no significant changes in the mean scores of the subgroups with advancing age. A fourth hypothesis postulates that the subgroups with more favorable mean scores in previous studies would continue to show more favorable mean scores at all age levels.

To test these hypotheses, a sample of one thousand teen-agers was drawn from the seventh, eighth, and ninth grades in six junior-high schools, and two hundred sixth-graders from six grade schools, in the public schools of Akron, Ohio. The schedule developed and utilized by Reckless and Dinitz in earlier studies was administered to these twelve hundred students in March and April, 1959. From the schedule data, scores on the Gough Socialization scale, a Concept of the Father scale, a Concept of Home and Parents scale, a Concept of Law and Order scale, and the Short-Nye delinquency scale were obtained for each respondent. Each child was evaluated by a qualified member of the school staff according to the child's delinquency probabilities. All these data were analyzed by grade for four dichotomized subgroups — race (Negro-white), sex (male-female), teacher nomination (good-bad), area of residence (good-bad) — and by extreme combinations of these subgroups (white female-Negro male, white female good nominee-Negro male bad nominee, white female good area-Negro male bad area).

The findings indicate that the mean scores of children on the socialization and self concept measures do not change with advancing age: the mean scores of the dichotomized subgroups and combinations of subgroup extremes do not change with age; and the mean scores of girls, whites, children nominated as good, children from good areas, and the extreme combinations are higher than those of their respective opposite subgroups.

In summary, the findings of this study support the basic hypothesis of Reckless and Dinitz, namely, that the

concepts of self and other are well established by the time children reach the age of twelve (sixth-grade level), and that these concepts can be measured at this level. The findings further indicate that self concepts are sufficiently retained by subgroups through advancing age so as to make the sixth-grade mean scores fairly reliable indicators of delinquency insulation or vulnerability of the subgroups in the seventh, eighth, and ninth grades, or up to the age of sixteen. Microfilm \$2.50; Xerox \$4.20. 78 pages.

**STRATIFICATION CONCOMITANTS
OF POWERLESSNESS AND NORMLESSNESS:
A STUDY OF POLITICAL
AND ECONOMIC ALIENATION.**

(L. C. Card No. Mic 60-1205)

Arthur Gale Neal, Ph.D.
The Ohio State University, 1959

The major objective of this study was to determine the significance of the relationships between occupation, status-aspiration, vertical mobility, and the powerlessness and normlessness aspects of alienation. Following Seeman's conceptual analysis, powerlessness is defined as a low expectancy held by the individual that his own behavior will determine the occurrence of the outcomes he seeks. By normlessness is meant a high expectancy that socially unapproved behaviors are required in goal attainment.

Guttman-type scales were developed to measure powerlessness and normlessness in political and economic areas. Data were collected by means of a questionnaire sent to more than six hundred persons in Columbus, Ohio. From those who did not return the mailed questionnaire, a sample (fifty subjects) was selected for interviewing. No significant difference in kind or amount of alienation was found between those who returned the questionnaire and those who did not.

An analysis of the findings indicated that manual workers are significantly higher in powerlessness than are non-manual workers. It was noted, however, that the non-manual workers tend to reflect the extremes of powerlessness--both high and low--more often than manual workers. A lack of organization and low income were significantly related to high powerlessness within the non-manual sample. Occupation was found to be significantly related to normlessness, but only under special circumstances. When rural origin and a high degree of residential mobility were each held constant, the manual workers were significantly higher in normlessness than were the non-manual workers.

Generational mobility, with no variable controlled, was not significantly related to either aspect of alienation. With age controlled, however, the upwardly mobile were significantly higher in normlessness than were the downwardly mobile or the stationary. Taking career change as an independent measure of mobility, a positive correlation was obtained between the amount of recent upward mobility and the degree of powerlessness.

Status-orientation was found to be significantly related to each of the aspects of alienation. Those with low status aspirations were found to be significantly higher in both

powerlessness and normlessness than those who are mobility-oriented. Consistent with the above correlations was the finding that the low status-striving manual workers were significantly higher in both powerlessness and normlessness than the mobility-oriented non-manual workers.

The maximum likelihood for both powerlessness and normlessness was found among the older, downwardly mobile manual workers who reject mobility values. By way of contrast, the least likelihood for both powerlessness and normlessness was found among the younger, stationary, non-manual workers who are mobility-oriented. Microfilm \$2.50; Xerox \$6.20. 130 pages.

SOCIOLOGY, FAMILY

**A COMPARATIVE STUDY
OF THE ROLE CONFLICT, MARITAL ADJUSTMENT,
AND PERSONALITY CONFIGURATION
OF PRIVATE ADOPTIVE
AND AGENCY ADOPTIVE PARENTS.**

(L. C. Card No. Mic 60-566)

Albert Jules Rosenstein, Ph.D.
University of Southern California, 1960

Chairman: Professor Peterson

The primary purpose of this research was to determine which of the two major types of adoption, private or agency, approximates the norm as expressed by a sample of natural parents. The criteria used in comparing the samples were the Hurvitz Index of Marital Strain, a test of role conflict; the Minnesota Multiphasic Personality Inventory, a test of personality patterning; and the Locke Marital Adjustment Test, a measure of marital adjustment.

The private adoption group consisted of a random sample of thirty families who were selected from the files of physicians in Los Angeles County. The natural parents were also randomly selected from these same doctors and numbered forty-five families. The thirty families comprising the agency adoption sample were selected from every available source because of the difficulty encountered in obtaining the necessary number of cases from any one local agency.

All the data were treated by an IBM computer, providing item analyses, chi-square, Kolmogorov-Smirnov statistics, critical ratios, and in the case of the MMPI, the Welsh configural analysis.

The findings concerning the frequency and intensity of role conflict in the samples were inconclusive, and the hypothesis dealing with this was neither accepted nor rejected but merely put aside for further research.

The data dealing with marital adjustment revealed significant differences in the total scores between the private and agency adoptive parents. The private adoption sample has greater marital adjustment than the agency adoptive group. Many individual items on the Locke instrument showed significant differences, which were in almost every case in the direction of poorer adjustment for the agency adoption group.

The findings on the Minnesota Multiphasic Personality

Inventory revealed significant differences, which, although within normal limits, still were in the direction of psychopathology on the part of the agency adoptive group. An analysis of the individual items which make up the MMPI revealed a considerable number which differentiated the agency adoptive group from the private adoptive and natural parents. An analysis of the T-scores for each of the nine clinical scales comprising the MMPI revealed significant differences, the elevated scales in each case belonging to the agency adoptive group. The Welsh configural analysis once again provided evidence which, although requiring further investigation, is to some extent indicative of neurotic patterning on the part of the agency adoptive sample when compared with the private adoptive and natural parent groups.

The problem of comparing private and agency adoption was investigated to determine whether the alleged differences between agency and nonagency placements existed. The research findings indicate this to be affirmative; however, the findings for the most part were not in the direction which one might expect. The results show that selected private adoptive techniques yield adoptive parents with better personality adjustment, who have greater marital satisfaction, than those selected using current agency selection techniques.

This study is in reality a point of departure for further research which ultimately should provide objective tools that will be able to determine the ability of an adoptive applicant to provide the environment necessary for the proper emotional development of a child.

Microfilm \$3.55; Xerox \$12.40. 273 pages.

A STUDY OF CONTEMPORARY PATTERNS OF ASPIRATIONS AND ACHIEVEMENTS OF THE PUERTO RICANS OF HELL'S KITCHEN

(L. C. Card No. Mic 60-531)

Milton S. Rosner, Ph.D.
New York University, 1957

Adviser: Dr. Joseph Bram

This study attempts to examine contemporary patterns of aspirations and achievements of one hundred Puerto Rican family units of Hell's Kitchen, New York City. More specifically, the objectives of this study are focused in the determination of the following:

1) The most significant sets of socio-cultural variables related to gradations of achievement in the family units involved.

2) The relationship of these patterns of achievement with levels of aspirations in Puerto Rico and New York.

In line with the assumption that the contemporary behavior of the Puerto Rican is positively related to cultural roots on the island, in each case we have juxtaposed island and mainland factors in order to arrive at a profile of individual and group patterns of achievement. We have been mainly interested in achievement in occupation, housing, income and self-improvement of family socio-economic status, these factors constituting the chief concerns of the Puerto Ricans on the island and the mainland.

The absence of contemporary data dealing with this

shifting, invading and expanding ethnic population since the last census in 1950 subsumes this study within the prototype of the exploratory-descriptive. A study of this type offered the possibilities of employing a multiplicity of techniques; for example, it permitted the examination of areal and census data, demographic characteristics for the island and the mainland, participant observation, the interview, and, to a lesser extent, the case study.

Since no intercensal reports were available the author took a "nose count" in the defined area of Hell's Kitchen of Puerto Rican families. From the total universe of 650 family units we took a systematic example, finally limiting our sample population to 100 family units.

The major research instrument, the schedule, was designed to examine personal history, cultural attitudes and attributes, levels of education, occupation, family role structure and assessed levels of aspiration and achievement.

The following methodological procedure was employed:

1) The citing of percentage distributions of all cultural variables relevant to the main themes in this study.

2) Estimates of differences in achievement pattern according to an Achievement Pattern Index.

3) Cross relating differences in achievement with a proliferation of selected variables to determine those characteristics most predominant for the sub-groupings and the total group.

4) Selection of case data to elaborate and illustrate variations within the sub-groupings and in the major categories.

We may summarize the findings of this study as follows:

1) A "high" sub-group of achievers (12 per cent of the total) records a consistently higher performance in occupational rank, combined income, degree of occupational mobility and superiority in housing conditions. This sub-group is characterized by the most frequent pattern of family solidarity, dual employment and action taken for self-improvement.

2) A "medium" sub-group (50 per cent of the total) are fairly stable in their employment pattern, show sporadic mobility, median housing conditions and the most intensive stability and security strivings of the sample.

3) A "low" sub-group (38 per cent of the total) are somewhat immobilized in their life status; of this group 50 per cent indicate a pattern of welfare reciprocity, ill-health and family disruption. This group dominantly live sub-marginal existences, expressing attitudes of fatalism and pessimism.

Crucial elements in distinguishing achievement levels are those of marital stability, multiple earning potential, physical type, level of education and occupational skill and differential attitudes of assertiveness in taking action for self-improvement. These elements, adhering varying to the sub-groups, generate:

1) high projection of aspirations and concomitant action taking.

2) leveling of aspirations to a flat plateau with increasing stability.

3) a realistic appraisal of present and future immobilization.

Microfilm \$5.40; Xerox \$19.15. 422 pages.

CHANGING IDEOLOGIES OF THE AMERICAN HOME

(L. C. Card No. Mic 60-1047)

Stephen S. Stanford, Ph.D.
University of Colorado, 1959

Supervisor: Associate Professor Edward L. Rose

Annual quantities of periodical literature published in America through many years and samples of its content have provided significant information about certain trends in American culture. This thesis treats with the results of three studies of magazine articles appearing from 1919 through 1955. Yearly frequencies of articles on subjects related to the home were compared with those on other subjects. Content analyses of editorials and articles in samples of these concerned leisure activities in the home and statements about use and style values relating to the home. The findings of this research enable certain interpretations about the home in American culture.

Ideational constructs about the home were found to have increased in America through many recent years. This conclusion is substantiated by the observed increase in the volume of articles appearing on the home and related topics. Nevertheless, such constructs about a large variety of non-home subjects increased to an even greater extent.

Inconclusive evidence appeared in support of the "dormitory" concept wherein the home is thought of simply as a place for sleeping, eating, and other personal care with leisure activities being sought outside the home. Several evidences appeared for an increased interest in sedentary activities in the home. Prominent among these were greatly increased numbers of references to parties and receptions in the home and increasing numbers of articles on all subjects--a large portion of which unquestionably provided reading matter for the home. The sum of statements about use values indicated a general increase in utilitarian interests with specific use values like controllability, efficiency, and area differentiation increasing most notably. At the same time, statements about all style values showed no change and those about the specific style value, novelty, decreased substantially. A number of evidences pointed to increased privacy interests in the home. Foremost was an abrupt frequency rise for articles on the barriers, walls and fences. This appeared for the last few years examined in wide deviation from most of the previous years. Evidences of changing interests in ostentation were rather inconclusive yet some decrease was suggested by the declining number of statements about conventionality and the already cited increased privacy interest.

Utopian ideas appearing in periodical materials, whether applied to existing homes or not, clearly had appeal in themselves. They involved images of an American standard of living--constituting for many a means of vicariously enjoying luxuries as well as necessities relating to the home. Persons never possessing their material counterparts unquestionably derived satisfactions from the images of their existence in a great American culture.

Aware of these interests and desirous of emphasizing them to the fullest, writers, editors, and publishers of periodical literature have developed thriving business enterprises in this country. Magazine articles on the home thus represent something more than simply ideas which they might have wished to promote; they also indicate what they

believed to be normative in society or at least certain classes or groups. And if not already normative, frequently and persistently published ideas must have assumed normative qualities--becoming therefore ideologies. Their widespread appearance would have made them seem normative to many having great confidence in the authoritative character of printed materials.

Historical trends in the disproportionate emphases given to home-related subjects have thus served not only as indicators of certain changes in ideologies of the American home but of the character and development of the culture itself. Microfilm \$2.50; Xerox \$7.20. 155 pages.

SOCIOLOGY, PUBLIC WELFARE

THE VANDALS:

A STUDY OF MALICIOUS MISCHIEF.

(L. C. Card No. Mic 59-6226)

John McCullough Martin, Ed.D.
New York University, 1959

Much has been written by social and behavioral scientists about juvenile delinquency. These specialists, however, have virtually ignored vandalism as a sub-type of delinquency although they have given considerable attention to such types of juvenile misconduct as truancy, theft, and drug addiction.

The present research was concerned exclusively with vandalism as a type of juvenile delinquency. The investigation was primarily an exploratory study of such behavior in the Borough of The Bronx, New York City, in 1955. In the study vandalism was defined as the offense "malicious mischief," specifically the willful destruction, damage, or defacement of property.

Comparisons between Bronx vandals reported to the Juvenile Delinquency Index of the New York City Youth Board in 1955 and Bronx juveniles reported to the Index the same year for offenses other than vandalism revealed that significant differences existed between the two groups in terms of their sex, age, and ethnic characteristics. No significant difference existed between the two groups in terms of the socio-economic level of the health areas in which they lived.

Comparisons between the characteristics of Bronx vandals adjudicated delinquent by the Children's Court in 1955 and the characteristics of other delinquent populations described in the literature suggested that, in addition to differences in their sex, age, and ethnic characteristics, vandals also differed from other delinquents in a number of their other characteristics -- e.g., the families of vandals seemed to be less mobile than the families of other delinquents.

Case studies of Bronx vandals adjudicated delinquent by the Children's Court in 1955 suggested that juvenile vandals could be classified according to three sub-types: Seriously Disturbed Vandals, Essentially Law-Abiding Vandals, and Sub-Cultural Vandals.

Examination of the acts of vandalism committed by Bronx vandals adjudicated delinquent by the Children's

Court in 1955 suggested that vandalism itself could also be classified according to three sub-types: Predatory Vandalism, Vindictive Vandalism, and Wanton Vandalism.

Implicit in this research was the theoretical position that to understand the "whys" of vandalism it was necessary to consider the characteristics of the juveniles who commit such delinquency, their home life, their peer group relationships, both the "objective" and "subjective" aspects of the situations in which vandalism occurs, and the neighborhood milieu to which vandals respond. However, to achieve a more complete understanding of vandalism it was necessary to go beyond the local milieu and to examine the very characteristics of American society which seem to foster vandalism and other types of crime and delinquency.

Various proposals for the prevention of vandalism and other types of delinquency were reviewed and evaluated. Particular attention was given to the limitations of the "clinical" compared with the community-centered approach in the prevention of delinquency, especially in view of the hypothesis that anomie or social instability was the primary characteristic of delinquency-prone neighborhoods.

Specific proposals were made with respect to the prevention of vandalism, including the proposition that although "clinical" devices might work well with Essentially Law-Abiding Vandals, these techniques would achieve only a modicum of success with Seriously Disturbed and Sub-Cultural Vandals. Although Seriously Disturbed and Sub-Cultural Vandals require the support of clinicians and others, their "rehabilitation" is not really a problem of treating individuals. Instead, it is a problem of reducing the social instability of local areas which foster the development of these types of delinquents.

The study concluded with suggestions for further research on the topic of vandalism. Particular attention was given to questions that must be answered if the tentative conceptualizations and hypotheses developed in the present investigation were to receive further testing.

Microfilm \$2.85; Xerox \$9.90. 217 pages.

**INTEGRATION OF SOCIAL WELFARE RESOURCES:
THE DYNAMICS OF WELFARE PLANNING.
AN ANALYSIS OF PROCESSES BY WHICH
INTEGRATION OF GENERAL HOSPITAL
AND LONG TERM INSTITUTIONAL FACILITIES
WAS ACHIEVED IN FIVE COMMUNITIES.**

(L. C. Card No. Mic 60-1149)

Robert Morris, D.S.W.
Columbia University, 1959

Community welfare planning is concerned with the organization of social welfare resources to meet a wide variety of human needs. It usually acts through myriad organizations responsible for providing health and welfare services. Deliberate and rational community efforts to plan these services in relation to need involves, among other things, change and integration. Modern society is a changing society and its social agencies must continuously adapt to new conditions. These new conditions increasingly require that the services of many agencies be integrated if effective action is to result.

This research reports on five cases of deliberate

planning by a central welfare federation to change social agency programs in the direction of closer co-operation and integration. The objective is a definition of the basic conditions of successful planning towards integration. Cases were selected with a view to limiting the variable factors affecting the planning results. Similar agencies, problems, community structures and time periods were involved in each case. Each involved a general hospital and a home for the aged or chronic disease institution under Jewish auspices, central community planning agencies with comparable powers and controls, and similar pressures to plan new facilities for the chronically ill. In three instances, the search for integration by a central organization was successful; in two instances, it failed.

Six factors emerged as essential to successful integration planning when dominant power to impose plans is lacking. These factors are useful in predicting the likely outcome of various planning situations; they help agencies select favorable areas in which to apply limited planning resources; and they constitute a step towards development of effective tools for deliberate planning of voluntary welfare resources.

Effective steps to alter agency patterns of organization depend upon certain pre-conditions. Integration of work among several agencies is most readily realized when each involved agency is confronted with a crisis disturbing the normal equilibrium of operations. These crises are usually induced by major social and economic forces, but occasionally they can be induced by deliberate human efforts, as for example, the withholding of financial support by a community chest. When these crises are experienced simultaneously by two or more agencies, optimum conditions prevail for planned intervention to re-direct forces toward a new pattern of organization.

Substantial social or functional interaction between the trustees of the involved agencies constitutes a second pre-condition for integration. Each social agency board is likely to represent, at its core, one major cultural, ethnic, or social group which determines agency policy. Such boards of trustees are most likely to approve a major alteration in program and close co-operation with another organization, when the trustee members have already developed significant channels of association with each other. Separate groupings of citizens are often bridged through informal contacts in economic or social affairs. These channels help break down the separation of ethnic, religious and cultural groups, although they do not completely bridge the distance between economic and social classes. These common means of group association constitute a vital underpinning for the formalized association among social agency trustees.

Once trustee interaction has begun, and an organizational crisis has arisen, then rational planning tools can be applied to shape or re-shape patterns of inter-agency organization. Four tools are identified for such current planning or decision making: (a) a central planning structure capable of developing a specific plan of re-organization but primarily committed to furthering co-operation among its members; (b) leadership with high community status, capable of bridging the aspirations of separate agency boards and possessing negotiating skill to modify agency autonomy without destroying it; (c) a discriminating use of incentives which augment agency pride in achievement and offer financial rewards in return for sharing a community wide program; (incentives can be used to modify

and alter agency relationships provided they are in the direction of agency aspirations; or where a re-direction is sought, are based upon these aspirations); (d) professional studies and consultations which serve to re-inforce local conviction that a re-patterning is possible and desirable and which broaden the goals of re-organization. (The exact pattern of re-organization is developed by the interplay of local forces as modified by the other tools, and is not produced by expert advice alone.)

Microfilm \$4.55; Xerox \$16.00. 355 pages.

SOCIOLOGY, SOCIALISM, COMMUNISM, ANARCHISM

AMERICANIZERS OF MARX

(L. C. Card No. Mic 60-927)

David Sprague Herreshoff, Ph.D.
University of Minnesota, 1959

Efforts of labor radicals in the United States to shape American labor movements into engines of revolution have hitherto ended in one of two ways. Radicals have either abandoned their radicalism, as in the cases of Orestes Brownson and Earl Browder, or they have maintained their radicalism in isolation from the main current of American labor, as in the cases of Friedrich Sorge and Daniel De Leon. From the vantagepoint of the nineteen-fifties, however, the failure of labor radicalism in the United States cannot be regarded as an American peculiarity, for radical ineffectiveness in America has been paralleled by the experience of labor radicalism in Western Europe. If there is an exceptionalism which exempts certain societies from the impact of a revolutionary labor movement, it has belonged not just to the United States but to the cluster of

economically advanced Western nations which Gunnar Myrdal has shown to be an island of plenty in a world ocean of poverty. In all countries of this cluster the labor movement has tended to be, in the main, a reform-minded pressure group rather than an agency of radical social change.

Americanizers of Marx, as defined in this study, sought to imbue the labor movement with the socialist goal and to win a hearing for the Marxist doctrine in America while maintaining the radical integrity of Marxism. This study is concerned with the impact of American conditions on these leaders and with their efforts to master those conditions. It concentrates on the interaction between the images of America held by the leaders and their tactical responses to these images. Consideration of the dialectic between Marxist expectations and American experience which developed in the minds of the subjects of this study, it is hoped, illuminates the milieu of men and events in which the Americanizers of Marx have moved.

Four American labor radicals are studied. The first is Orestes Brownson, the representative of the earliest American labor radicalism who is the nearest approach to an American Marxist before Marx and is at the same time a remarkable embodiment of the diverse possibilities which were later brought together in the American Socialist Party in the time of Debs. The discussion of Brownson provides a frame within which to consider the American Marxists proper whom I have chosen to study. These are the German-American pioneers of Marxism, Joseph Weydemeyer and Friedrich A. Sorge and the shaper of the Socialist Labor Party, Daniel De Leon.

It is my belief that Brownson, Weydemeyer, Sorge and De Leon established the patterns for development of American labor radicalism and that the subsequent history of Marxism in America has reflected character of variations on previously stated themes. The comparatively familiar efforts of the Socialist and Communist Parties to organize a mass labor-radical movement in the United States, in conclusion, reviewed and related to the earlier efforts as well as to the possibility for a revival of American labor radicalism. Microfilm \$5.00; Xerox \$17.80. 392 pages.

SPEECH-THEATER

ASPECTS OF STAGING OF PLAYS OF THE GOTHIC REVIVAL IN ENGLAND

(L. C. Card No. Mic 60-1168)

Walter Charles Adelsperger, Ph.D.
The Ohio State University, 1959

The primary aims of the study were to determine the nature of the scenery that was employed in staging Gothic plays, to determine where the various scenic elements were located on the stage, and to determine the most frequent types of alternations of scenes.

The secondary aims were to determine the types of stage effects employed in Gothic productions and the fre-

quency of their use, to determine the extent to which the playwrights' concepts were realized upon the stages, and to locate the relationships between staging practices of Gothic productions and productions of nineteenth-century melodramas.

The materials for the study consisted of about 50 prompt-books of productions of Gothic dramas, about 25 acting-edition scripts of Gothic plays, and about 15 promptbooks and acting-edition scripts of nineteenth-century melodramas. These materials were analyzed and the results interpreted. The results were then synthesized to obtain a generalized picture of certain staging practices in Gothic productions.

It was found that the productions relied heavily upon

stock scenery, and of the productions that were analyzed all could be staged with only three sets of wings. Of these, a given set often remained in place for a number of successive scenes, so that a great many scene shifts involved only the moving of flats at the back, while the wings remained untouched. Set-pieces were not employed in the majority of scenes.

Early productions used scenery merely as a backing, whereas later productions attempted to express specific locality through the scenery. Furniture, however, was rarely used, and was often omitted even though "required" by the script. Stage managers were apparently reluctant to place or remove furniture in sight of the audience.

Almost one-half of all scenes were shallow. Deep scenes were used mainly for the accommodation of set-pieces, and shallow scenes alternated with deep scenes most of the time.

Special effects were used less frequently than hitherto suspected, and effects "demanded" by the scripts were often omitted from productions. The effect scenes that did occur in various plays closely resembled each other both in writing and staging. Fire scenes were probably often represented by painted elements rather than by actual fire, and stage traps were used only one-third of the time for spectral effects. "Vision" appearances were favored above all others, and tableaux were freely used at any time during the action--not merely at the ends of scenes.

Productions of Gothic plays and of nineteenth-century melodramas were similar in the types of environments and effects employed, but melodramas made greater use of set-pieces and their effects tended toward greater verisimilitude.

Areas suggested by the study for future examination are lighting techniques, patterns of stage movements, and the significance of a number of obscure prompters' notes which may have conventional meaning.

Microfilm \$3.80; Xerox \$13.30. 295 pages.

KIERKEGAARD'S THEORY OF COMMUNICATION

(L. C. Card No. Mic 60-908)

Raymond Eugene Anderson, Ph.D.
University of Minnesota, 1959

Literature on values and value communication has largely neglected the work of the Danish philosopher, Søren Kierkegaard (1813-1855). In a vast authorship comprising some thirty titled works which includes aesthetic literature as well as psychological, philosophical, and theological writings, he sets forth an existential view of values, classifies them into aesthetic, ethical, and religious, and offers a theory of "existence-communication." The essential ingredient of ethicality and religiousness, in Kierkegaard's view, is "subjectivity." Subjectivity is a complex concept with many dimensions of meaning, including: inwardness, passion, concrete self-knowledge, perseverance, volitional striving, self-actualization, a break with "immediacy," and the experience of freedom and accountability.

The problems of communication which arise in the ethicoreligious sphere, according to Kierkegaard, center in the nature of subjectivity, for subjectivity is neither an idea to be explained, a proposition to be proved, a feeling

to be aroused, nor a pattern of conduct to be actuated. He contends that a communication which seeks the self-actualization of the recipient can at most be an occasion for independent self-activity. Kierkegaard's theory of communication has relevance to a number of problems of current interest: the relation of rhetoric to homiletics, the description and classification of forms of discourse, the current "crisis in communication" in the area of religion, the meaning of "communication," and the theory of nondirective counseling.

Kierkegaard points up certain limitations of "direct communication" in relation to subjectivity and contrasts informative, argumentative, and persuasive discourse with "edifying discourse." He contends that informative discourse encourages the listener to apprehend abstractly and objectively what he ought to apprehend concretely and subjectively; argumentative discourse tends to produce intellectual conviction rather than subjective appropriation; and persuasive discourse tends to influence thought and action without regard to subjectivity. A direct mode of communication is particularly ineffective, Kierkegaard contends, in dispelling the ethicoreligious illusions of sentimentality, externality, and speculation.

Kierkegaard shares with Socrates a concern for genuineness in the moral life and a disdain for affectation and sophistry in all their forms. Like Socrates, he sees a need for an indirect approach to the task of dispelling ethico-religious illusions. Kierkegaard develops a theory of indirect communication centering in the concept "sign of contradiction," and he employs many techniques of indirection in his own writings. One form of indirect communication which Kierkegaard finds particularly useful is the comic. He presents a theory of the comic and relates it to values by showing that the higher makes the lower comical.

Finally, Kierkegaard articulates principles of edifying discourse and offers his reader several volumes of edifying discourses. The edifying speaker, he contends, ought to address himself to the individual as an individual, present ideality in the concrete, emphasize the process of "existing" rather than the result, confront the listener with possibility, and respect the listener's independence. One function of edifying discourse, as Kierkegaard sees it, is to potentiate despair. He defines despair as an absence or loss of the self and describes several forms of despair as defenses against the anxiety of freedom and responsibility. He contends that edifying discourse ought to potentiate despair in the sense of increasing unrest, self-concern, self-awareness, and self-activity. Kierkegaard's theory of edifying discourse culminates in a view of the Christian sermon as a unique form of discourse involving paradoxical claims regarding Christ, the God-Man. The Christian clergy have often overlooked the peculiar nature of Christianity, he contends, and their failure to understand it as a paradoxical existence-communication has led them to misinterpret the task of Christian preaching.

Microfilm \$5.80; Xerox \$20.50. 454 pages.

MODERN TRAGEDY AND ITS ORIGINS
IN DOMESTIC TRAGEDY:
A STUDY OF SELECTED ENGLISH
AND AMERICAN DOMESTIC TRAGEDIES
FROM ELIZABETHAN TO MODERN TIMES.

(L. C. Card No. Mic 60-912)

Herbert L. Carson, Ph.D.
University of Minnesota, 1959

Domestic tragedy arose as a definable form in sixteenth-century England. This genre differs from idealized tragedy in several elements: the characters are not elevated, their surroundings are simple and familiar, the stories deal with personal and family relationships, the treatment is generally realistic, and while the ending usually involves death or a similar catastrophe, the consequences are rarely widespread.

During the non-Aristotelian Elizabethan period, the genre developed out of the moral and introspective qualities of the older miracle and morality plays. In the seventeenth century, the sentimental tragedies of Otway and Southerne were influential. The diatribes of Collier and later the sentiments of Steele helped shape eighteenth-century domestic tragedy. As the sentimental influence grew, the genre coalesced with sentimental comedy and became akin to melodrama. Influenced by Ibsen, the plays of Pinero, Jones, and others made domestic tragedy the dominant type of serious drama in England, Ireland, and the United States. While development has not been confined to English-speaking countries, it is not too much to say that *Arden of Feversham* (c. 1591) is the ancestor of *Death of a Salesman* (1949).

One contribution of domestic tragedy to serious drama is its influence upon language. The earlier plays used blank verse, the medium common to the times, but the simplicity of language and its relevance to character was to affect later developments in diction. Equally important was the experiment with prose undertaken by George Lillo in *The London Merchant* (1731). By the modern era, prose had become the standard language of serious drama. Modern playwrights have sought to achieve dramatically vivid language without metric form.

Domestic tragedy is a didactic drama which reflects the central ideas of its age. The orthodox theology of the sixteenth century, the moral sentiment of the eighteenth, the naive justice of the nineteenth, and the unsure values of the twentieth are reflected in the genre's major plays. The earlier dramas were insistent upon stern moral lessons, later plays sought to obviate tragic effect through sentiment, others were poetically just, and modern tragedy tends toward a more sobering conclusion. Using familiar characters and events, the genre achieves realism which reinforces its many lessons about human and social relationships.

Society, however, is always secondary to character. The traits which lead a character into tragedy are essentially simple and clear, based on a tragic error, although not the "great" error suggested by Aristotle. In general, the tragic victims are every man, with familiar simplicity and interesting uniqueness. Unfortunately, earlier domestic tragedy relied heavily upon accidents and the machinations of villains so that often the central figure lacked the inner drives which lead toward tragedy. In modern domestic tragedy, however, the tragic victim's inner being

brings him to disaster. This disaster is usually death, although modern tragedy also depicts tragic consequences of a psychological rather than a physical nature. It is in the very depiction of human suffering that modern tragedies are superior to earlier domestic tragedies.

While domestic tragedy does differ from idealized tragedy in its use of ordinary people suffering personal disaster in their home environment, the genre is not necessarily non-tragic. In several of the older plays and in many modern plays can be found the spaciousness and dignity that simultaneously arouse and purge emotions of pity and terror. Perhaps domestic tragedy in English has not achieved the literary and dramatic heights of Ibsen's dramas, but it is an ever-progressing, ever-improving form. More and more, domestic tragedy depicts the tragic essence not only of its own characters but indeed of the entire modern world.

Microfilm \$2.95; Xerox \$10.35. 228 pages.

AN INVESTIGATION
OF APHASIC VERBAL LEARNING

(L. C. Card No. Mic 59-6548)

Henry Goehl, Jr., Ph.D.
University of Pittsburgh, 1959

This study sought to test the effects of variations in word-frequency and word-length on the verbal learning of aphasic subjects.

A learning task was devised and a sample of four female and nine male aphasics given trials on two word lists in which each of the independent variables were equally represented. Subjects were also tested for their ability to read the words orally.

Analysis of the data contradicted the assumption that subjects would learn under the conditions of the experiment. Several aspects of experimental procedure were held responsible for the lack of learning.

When performance was interpreted in terms of repeated trials on a verbal task, variations in word-length proved significant. More correct responses were made in relation to short words than long words. This result was explained on the basis of a standard exposure time which may have favored short words. Results agreed with previous studies concerning the effects of word-length on other aphasic performances.

The effects of variations in word-frequency favored frequently used words over infrequently used words but this difference was not statistically significant. It was concluded that either this variable is not an important factor in performance of this kind or that the task was not sensitive enough to detect true differences between the effects of infrequent and frequent words.

When word variables were compared in terms of number of incorrect responses and total (correct plus incorrect) number of responses, only variations in word-frequency proved significant. Subjects appeared to reveal a bias to respond with the more frequently used words.

The significant effects of word-length and apparent response bias found for word-frequency suggested that these were important in aphasic performance on tasks like those used in this study. Further research on their relation to aphasic verbal learning seemed indicated.

Oral reading was significantly affected by variations in both word-length and word-frequency. More correct responses were given to short words and to frequent words. This result supports the findings of earlier research.

Significant relationships were found between oral reading performance and performance on the verbal task. This was taken as an indication that previous learning, revealed by relative ability to read words, facilitated correct responses in relation to these words on the verbal task.

Coefficients examining the relation between scores on the verbal task and such variables as length of time aphasic, length of time in therapy, ratings of severity, progress, and prognosis were statistically significant. Similar consideration of oral reading scores showed that none of the coefficients were statistically significant. The latter result was related to the extreme homogeneity of the seven readers who almost invariably received the most favorable scores and ratings.

Significant correlations and the apparent importance of oral reading were further interpreted as implying a functional relationship between performance and the intactness of pre-traumatic verbal habits along with the amount of retraining since trauma.

The relationship between some ratings (rater reliability unknown), some organismic variables, and performance suggested the need for continued study on the chance that such variables may be found to predict performance in other areas as well as relative ability to profit from therapy.

The most promising revision of the original learning task was tested on several additional subjects. Performance indicated that aphasic subjects could show adequate learning patterns when level of task difficulty was appropriate and deficiencies of the original task were corrected. Suggestions for further revision and use of the method were given.

Microfilm \$2.50; Xerox \$6.20. 127 pages.

AN ANALYSIS AND EVALUATION OF THE 47-WORKSHOP OF GEORGE PIERCE BAKER. (VOLUMES I AND II).

(L. C. Card No. Mic 60-1187)

Cecil Ellsworth Hinkel, Ph.D.
The Ohio State University, 1959

It was the purpose of this investigation (1) to make a study of George Pierce Baker, the man, as related to the 47 Workshop, in order to determine his objectives, how he established the Workshop, and his qualifications for operating it; (2) to make a detailed study of the history of the 47 Workshop in order to ascertain the steps leading to its formation, the method of its operation, and its year-by-year activities from its inception at Harvard in 1912 to Baker's retirement at Yale in 1933; and (3) to evaluate the accomplishments of Baker and the Workshop by determining the extent to which the purposes were fulfilled or the results fell short of the objectives and the relative place of Baker and the Workshop in the history of educational theatre.

Sources of primary material consulted consisted of all the personal correspondence, notebooks, scrapbooks,

newspaper clippings, theatre programs, and other memorabilia in the Baker Collections of Harvard and Yale and the published writings, interviews, and speeches of George Pierce Baker. In addition, Baker's widow and certain former members of the Workshop were consulted. All available material written by others on the subject was studied as sources of secondary information.

To an appreciable extent Baker's chief objective--to aid in providing America with a body of worth-while drama--was accomplished: The works of at least four of his playwriting students--Barry, Behrman, Howard, and O'Neill--have made definite and notable contributions to American drama.

The purposes of the Workshop were, for the most part, accomplished: It provided proper acting, an adequate theatre, outstanding backstage artists, an excellent organizational setup, and sufficient funds to mount properly before an audience of critics the plays of merit written by the students of the playwriting classes. It fell short of its objective only in the facet of directing: It seems that Baker, though a strict disciplinarian, lacked the creative imagination and inventive skill required of a good stage director.

The over-all accomplishments of the organization were outstanding: It trained actors, critics, designers, directors, playwrights, producers, and teachers who have since made names for themselves through their respective contributions to the professional, community, and educational theatres throughout the United States and in several foreign countries.

George Pierce Baker and the 47 Workshop occupy the foremost position in educational theatre: Their contributions to the formation and development of the educational theatre were great and far-reaching, placing them unchallengeably at the head of all educational theatre workers up to the present date.

Microfilm \$8.20; Xerox \$29.25. 646 pages.

THE RHETORIC OF THOMAS H. HUXLEY AND ROBERT G. INGERSOLL IN RELATION TO THE CONFLICT BETWEEN SCIENCE AND THEOLOGY.

(L. C. Card No. Mic 60-928)

John Vernon Jensen, Ph.D.
University of Minnesota, 1959

One of the most intense rhetorical conflicts during the late nineteenth century in Great Britain and the United States was between advocates of orthodox theology and those who found in science a basis for attacking this orthodoxy. The adherents of science challenged both the theological method of ascertaining truth and the teachings of theology relative to the creation, meaning, and destiny of man and his universe.

Outstanding leaders in the attack on orthodoxy were the English biologist, Thomas H. Huxley (1825-1895), and the American lawyer-politician and orator, Robert G. Ingersoll (1833-1899). Their effectiveness was due to many factors. The period was one in which a rhetoric challenging traditional religious concepts could flourish. Furthermore, although the two agnostics were out of harmony with the prevailing religious views of their time,

they imaged the fundamental political, economic, social, and moral values of their generation. They produced their enormous amount of written and oral discourse only after they were mature in religious views and in rhetorical powers. In addition, both men were aided by helpful personality traits, effective rhetorical attributes, and factors of health, emotional security, and geographical habitat.

An analysis of their rhetorical method reveals some significant similarities. Both men conceived themselves to be in the rhetorical situation in which they were removing a road-block (theological orthodoxy) which was in the pathway of man, hindering him from utilizing and enjoying certain procedural and substantive ends. The fundamental rhetorical action taking place in this process was one of a dramatic, two-valued alternative, for it was a struggle between the forces of good and evil, with no middle ground. This two-valued orientation, which is so basic in the rhetoric of the theologian, was revealed in the construction of figurative dichotomies, in the creation of vivid heroes and villains, in the sharp contrast between the ideas and deeds of the villains and heroes, and in the insistence that a reconciliation between the two forces was impossible. Other strategies basic to the rhetoric of the theologian were also duplicated by the two agnostics, such as their depiction of the history and ultimate destiny of the conflict, their dogmatism, their assumption of the stance of an inspired messenger, and their use of Christian symbolism. Ingersoll more closely duplicated this theological framework than did Huxley.

But within the structure of these basic similarities the two men displayed some noticeable differences. Ingersoll's attack on the road-block was characterized mainly by a blunt, overwhelming frontal assault, whereas Huxley's chief weapon was a more subtle flank attack. Ingersoll entered the fray on his own initiative, whereas Huxley was drawn into the battle and engaged in more defending and counterattacking than did Ingersoll. Huxley narrowed the conflict, concentrated on specific areas, and analyzed basic issues more fully and systematically. Huxley was more careful in his preparation, more precise, accurate, thorough, and better organized. He relied less on humor and poetic imagery than did Ingersoll. Huxley was more of the academician engaged in rhetoric whereas Ingersoll was the orator engaged in rhetoric.

The following observations may be drawn from this study. If a rhetorician is anxious to destroy some entrenched force in society, it would be well if he were in harmony with the other main values of society; and if a rhetorician is out of harmony with prevailing concepts, it might be effective to use familiar and accepted rhetorical patterns. Microfilm \$6.20; Xerox \$22.05. 487 pages.

**AN EXPERIMENTAL STUDY OF SEVERAL METHODS
OF TEACHING BASIC COLLEGE SPEECH COURSES
WITH EMPHASIS ON CONSERVATION OF
TEACHERS' TIME AND VARYING CLASS SIZE**

(L. C. Card No. Mic 60-560)

Albert Whitney Knox, Ph.D.
University of Southern California, 1960

Chairman: Professor Dickens

The purpose of this study was to test experimentally the effectiveness of several methods of teaching a college

course in basic speech; the methods were designed to conserve teachers' time.

The problem was divided into the following constituent questions: (1) What are the effects of combining several sections of basic speech into a large lecture group for every fourth meeting and having all lectures given by one lecturer? (2) What are the effects of combining several sections of basic speech into a large lecture group for every fourth meeting and having each lecture given by a different lecturer? (3) What are the effects of maintaining the normal-size class and discarding the lecture as a form of instruction, using only the instructor's constructive criticism when appropriate? (4) What are the effects of doubling the size of the class?

The study was designed to permit the experimental testing of teaching methods which might allow a more efficient utilization of teachers' time without sacrificing the quality of instruction. The significance of the study rested on its direct relationship to the predictions of rapidly rising college enrollments and upon the fact that any improvement in teaching efficiency is a worth-while contribution.

The subjects for the experiment were students enrolled in the basic speech course at Kansas State University during the spring of 1957. Seven hundred and eighty students were enrolled, with 478 in the final data. These students were assigned at random to 41 sections of basic speech, which were taught by the faculty of Kansas State University Department of Speech. Fifteen instructors were involved, their experience ranging from one semester to thirty years and academic rank from teaching assistant to professor.

Measuring instruments were designed to obtain the following information: (1) Competence in subject matter as measured by graded written examinations which had been administered under controlled conditions and which covered material equally available to all from the textbook. (2) Proficiency in speaking as measured by graded results on a detailed rating scale used by a critic-grader other than the student's instructor. (3) Proficiency in preparation and organization of speeches as indicated by prepared outlines given to the critic-instructor before each speech. These outlines were rated on an outline rating sheet.

A pretest in each of the three areas allowed matched groups of large populations to be obtained, and the post-test data from these groups were treated by the statistical technique of a significance of a difference between the means of two large samples. Each of the experimental groups above was compared with a control group. Critical ratios were determined using Fisher's table of *t*. The usual 1 per cent and 5 per cent levels of confidence were employed in the interpretation of the data.

Within the limits of the experimental design the following conclusions seemed justified: (1) The large lecture group using one lecturer for eight classes was not found to be significantly different from the control group in the written test and outline areas, but was inferior to the control group in oral performance at the 5 per cent level of confidence. (2) The large lecture group with several lecturers was not found to be significantly different from the control group in any of the three areas studied. (3) The small lecture group was not found to be significantly different from the control group. (4) The no lecture group was found to be very significantly better in the outline area and not significantly different in the areas of written

and oral achievement. (5) The double-size class was found to be significantly inferior at the 1 per cent level in both the oral and outline areas.

Microfilm \$2.50; Xerox \$5.20. 105 pages.

ON WITH THE SHOW:
A STUDY OF PUBLIC ARGUMENTS IN FAVOR
OF THEATRE IN AMERICA
DURING THE EIGHTEENTH CENTURY,
DESIGNED TO SHOW THE RELEVANCE
OF THE ARGUMENTS TO THE PHILOSOPHIES
AND BELIEFS DIRECTING AMERICAN LIFE
DURING THAT CENTURY,
THE VARIETY AND EMPHASES
OF THE ARGUMENTS OFFERED,
AND THE QUANTITY OF MATERIAL SET FORTH BY
THE ADVOCATES OF THEATRICAL PERFORMANCES.

(L. C. Card No. Mic 60-829)

Van Carl Kussrow, Jr., Ph.D.
Indiana University, 1959

At its inception, the theatre in America was hampered in its development not only by the hardships one would expect to encounter in a newly settled land, but also by legal and religious decisions forbidding presentation of or attendance at such entertainments. Calvinistic theology was the dominant intellectual force which guided and determined the beliefs, actions and prejudices of the majority of the colonists during the seventeenth and early eighteenth centuries. Even when these religious premises were questioned or discarded during the latter part of the eighteenth century, the culture pattern in the northern section of the country remained, in a large measure, bound by the conventions of thought, word, and deed which characterized the Puritan way of life. The theatre, while favored by the more liberal Anglicans and Roman Catholics, was severely condemned and attacked in practically every way by those of Calvinistic persuasion from letters of protest to the papers to actual destruction of theatre buildings. In spite of such opposition, the actors continued to perform and the audiences continued to grow in number. The Puritan position has received considerable attention by scholars, but the arguments offered to the public in favor of the theatre in America during the seventeen hundreds have been neglected by the theatre historians except to be mentioned in a cursory fashion as illustrative of the general situation.

It is, therefore, the purpose of this study to present as many published or public pro-theatre arguments set forth during the eighteenth century in America as possible, to analyze them in the light of their contemporary culture pattern, and to give some thought to the quantity of arguments as well as the type and quality.

Among the various propaganda devices used were prologues and epilogues to stage performances, books, essays, pamphlets, letters-to-the-editor, verses, editorials, petitions, memorials, playbills and other theatrical advertisements, speeches, and the like. The imprimatur accorded the theatre by the patronage of eminent and respected citizens was one of the most powerful forms of argument, though non-verbal, the theatre had on its behalf during the eighteenth century.

The arguments themselves were concerned, to a large extent, with proving the theatre a moral, and therefore beneficial, addition to any community. The usefulness of dramatic entertainment in making the audience "feel for other's woe," elevating one's mind, showing how virtue results in "pure joys," scourging vice, and rousing the passions in the cause of the "good" and the "right" was stressed. Inasmuch as the theatre's chief function was regarded as a teaching mission, it is no wonder that many of the arguments deal with how this teaching is done and why dramatic representation is the most efficacious means of doing it. The answer offered was, in essence, that a person would learn something better--whether this be a lesson in manners or morals--if the emotions became involved in the process. In this respect, the theatre-school outshone all other institutions of learning.

As rationalism infiltrated the teachings of the Church and nationalism became the dominant social motif, the opposing forces in the theatre controversy began to have certain beliefs in common. During the last two decades of the century, the primary question was: Do the rights of men, guaranteed by the Constitution, extend to participating in theatrical performances from either side of the footlights? Once the legality of the theatre was established, one phase of the battle ended.

Whatever impact the arguments in favor of the theatre had on changing men's opinions, the truth of the matter is more nearly approached when one says that the changing social, political, and religious views in this country made the theatre an acceptable form of entertainment to most of the citizens by the end of the eighteenth century.

Microfilm \$5.20; Xerox \$18.25. 405 pages.

AN EXPERIMENTAL INVESTIGATION OF REPRESSION
OF THE AUDITORY PERCEPTION
OF DISTURBING WORDS AS INDICATED BY VERBAL
AND ELECTRODERMAL RESPONSES

(L. C. Card No. Mic 60-564)

Edmund Charles Nuttall, Ph.D.
University of Southern California, 1960

Chairman: Professor Garwood

The purpose of this study was to investigate the effects of repression on the auditory perception of words. Otto Fenichel states that "Whenever a stimulus gives rise to painful feelings, a tendency is developed... to ward off the stimulus." The following three aspects of this concept of perceptual repression were tested. (1) Perceptual defense hypothesis: Thresholds for the correct recognition of disturbing words are higher than the correct recognition thresholds of neutral words. (2) Subception process hypothesis: Incorrect guesses of disturbing words at pre-recognition exposures are less accurate than the incorrect guesses of neutral words at prerecognition exposures. (3) Subception effect hypothesis: Electrodermal responses to disturbing words at prerecognition exposures are greater than the electrodermal responses to neutral words at prerecognition exposures.

A search of the literature revealed that (1) findings of the investigations contradicted each other, and (2) investigations were inconclusive due to experimental errors.

Verbal and electrodermal responses of thirty young male subjects to twelve selected words were measured. Stimulus words were spoken, employing the ascending limits method. Four standard words, found by investigation to be among the most disturbing in terms of the test criteria, served as the experimental variable. The remaining eight words, assumed to be neutral, were used for the control variable.

Following the experiment, subjects were tested on the frequency of usage of each stimulus word. Ratings were combined with the Thorndike-Lorge counts to establish a measure of the frequency and recency of usage of the stimulus words by the subjects.

Conclusions. 1. Perceptual defense hypothesis:

(a) Normal individuals do not protect themselves from disturbing stimuli via perceptual defense. In other words, disturbing stimuli need not be presented with more intensity than neutral stimuli in order to be recognized by a normal listener. (b) Previous investigations which have reported a difference between the thresholds of recognition for disturbing and neutral words have had their data confounded due to factors other than disturbing quality of the dependent variable. The confusing factors could have been the set of the subjects, responses withheld by the subjects, and/or the inability of the experimenter to determine the frequency-recency of usage of the stimulus words by the subjects. (c) The three factors, mentioned above, which confounded investigations of the perceptual defense hypothesis can be controlled in an experiment.

2. Subception process hypothesis: (a) A tendency for normal listeners to ward off disturbing stimuli is demonstrated by the subception process findings of the investigation. The results of the study concur with McGinnies, who has done the only other investigation of the subception process hypothesis, to the writer's knowledge. The conclusion of both studies was that the accuracy of guesses to prerecognition presentations of disturbing stimulus words was significantly less accurate than the guesses of prerecognition exposures to neutral words. The method of determining "accuracy" differed between the two studies. (b) The inference was drawn that through some method, which neither McGinnies nor the writer felt qualified to speculate upon, individuals respond with a repressive mechanism to information insufficient to allow recognition by the individual. In order for repression to be summoned, the listener must discriminate between disturbing and neutral stimuli with less information than is required for recognition of the stimuli.

3. Subception effect hypothesis: This investigation did not provide any data using electrodermal responses which allowed a further understanding of the perceptual process referred to as subception effect. The attempts to gain evidence on the subception effect were inconclusive.

The investigation was summarized as verifying, with qualification, Fenichel's statement that "Whenever a stimulus gives rise to painful feelings, a tendency is developed . . . to ward off the stimulus."

Microfilm \$2.50; Xerox \$4.60. 90 pages.

LEVELS OF ATTENTION GIVEN TO TELEVISION BY HOUSEWIVES OF TUSCALOOSA, ALABAMA, IN 1955.

(L. C. Card No. Mic 60-1215)

Don Crawmer Smith, Ph.D.
The Ohio State University, 1959

In order to determine the amount of attention given to television, housewives in homes with television in Tuscaloosa, Alabama, selected by systematic area sampling, kept a one-day diary of their television activities, and provided detailed information about programs they heard at eight selected periods during a follow-up interview the day following the diary day. Usable diary entries were secured from 885 housewives, and final interviews from 780 housewives who had heard programs at one or more of the selected test periods.

Three indices used to determine levels of attention, all indicating a high level, were reports in the diary of the activity of "just watching" while the television set was turned on; and from the follow-up interview, subjective estimates of "close" attention given the program; and "correct" sponsor identification. Information was secured, from the final interview, on degree of liking for programs, with the following three measures indicating a high degree of liking: subjective expression of liking the program "very much," selection of the program by the housewife, and a report of seeing the program every time it was broadcast.

A high level of attention was given by housewives to evening programs they heard in nearly 60 per cent, and to daytime programs in about 40 per cent, of the cases. A comparison of levels of attention with characteristics of the housewives revealed that, in general, attention was higher among housewives who were older, nonwhite, from small families, with moderately low levels of formal education, from homes with low standards of living. In the evening, quiz and human interest programs, and in the daytime, drama programs received the highest levels of attention. Variety programs, as a type, received the lowest levels of attention during both daytime and evening.

Housewives reported liking the programs they heard "very much" in about 65 per cent of the cases; a neutral or a negative reaction was expressed in fewer than 10 per cent of the cases. As with attention, quiz and human interest programs received the highest liking, variety programs the lowest. Housewives selected the programs they heard in more than 85 per cent of the cases in the daytime, and in about 45 per cent in the evening. Daily programs were reported seen every time they were broadcast in about 60 per cent, evening programs in about 67 per cent, of the cases. The types of programs which were seen the most frequently were serial drama in the daytime, and quiz and human interest programs in the evening.

A reasonably close relationship existed between levels of attention and degrees of liking. The index of attention which related most closely to the other two indices and to the three measures of liking was the subjective estimate. The index least closely related was activities. Little relationship was found between ratings for evening programs and levels of attention.

The following conclusions were reached concerning attention given by housewives to television:

1. The subjective estimate of attention comes nearer to being an average measure of attention than do activities of housewives or sponsor identification.
2. Levels of attention given to television in the evening are likely to be moderately higher than are levels of attention in the daytime.
3. Programs which depend heavily on comedy are likely to receive lower levels of attention from housewives than are other programs.

4. The characteristics of age, levels of schooling, race, size of family, and standard of living are related to levels of attention.

5. Housewives who are relatively unsophisticated likely give higher levels of attention to television than do housewives who are relatively sophisticated.

Microfilm \$3.65; Xerox \$12.85. 282 pages.

ZOOLOGY

LARVAL MORPHOLOGY AND METAMORPHOSIS OF BOLTENIA VILLOSA AND OTHER ASCIDIANS

(L. C. Card No. Mic 60-852)

Richard Alan Cloney, Ph.D.
University of Washington, 1959

Detailed histological descriptions of the larval tunic, epidermis, rudiments of the pharynx and digestive tract, rudiments of the atrium, atrial and branchial siphons, mesenchyme cells, nervous system, muscle cells, notochord and endodermal strand are presented for the pyurids *Boltenia villosa*, *Pyura haustor* and *Halocynthia igaboja*. Morphological features of these larvae are compared with larvae of the families, Styelidae, Rhodosomatidae and Ascidiidae.

The larval tunic of species of three families is shown for the first time to be composed of two distinct layers. The inner layer becomes the postlarval tunic and the outer layer is lost during metamorphosis.

The neurohypophysis is described for the first time in pyurid larvae. The possible function of protoplasmic processes extending from the luminal border of this structure in larvae of three families is discussed. Previously unreported complex features of the otocyst are described in pyurid and styelid larvae.

Three types of mesenchyme cells are described, counted and localized in the body cavity of *Boltenia villosa*, and identified in larvae of *Pyura haustor* and *Halocynthia igaboja*.

An examination of notochord development in eight species demonstrates that the fluid in this structure forms intercellularly as described by Kowalevsky (1866). Berrill's (1947) theory of intracellular vacuole formation is disputed.

Two distinct types of muscle cells differing in size, and in the arrangement, and number of myofibrillae are described in *Boltenia villosa*, *Pyura haustor*, *Styela gibbsii* and *Cnemidocarpa finmarkiensis*.

Emphasis is given to a description of metamorphosis and especially to a histological and experimental analysis of tail resorption in *Boltenia villosa*.

Morphogenetic changes involved in metamorphosis are rapid. Within 10 to 12 minutes after the beginning of

metamorphosis the tail shortens to about 20% of its length in the larva.

Morphological changes associated with tail resorption begin at the base of the tail and progress distally. As the tail shortens the muscle and notochordal cells gradually separate from each other and from the notochordal sheath in *Boltenia villosa*, *Pyura haustor* and *Styela gibbsii*. In contrast, tail resorption in *Ascidia callosa* does not involve the separation of these cells in the early stages. The tail tissues, except for the epidermis, form a coil in the posterior region of the trunk.

Tail excision experiments with larvae of *Boltenia villosa* including the removal of the posterior half of the tail before the beginning of metamorphosis; excision of the tail through the proximal region of shortening and, posterior to the proximal region of shortening after the beginning of metamorphosis support the following conclusions.

- 1) The trunk, the proximal end of the tail or both of these structures are essential to the initiation of shortening in the normal process of tail resorption. Once the tail begins to shorten all the necessary mechanisms for continuation of the process are present in the tail tissues themselves.
- 2) The process of shortening can be interrupted once it has begun by separation of the proximal shortening region from the distal unaffected region.
- 3) Some factor or complex of factors, perhaps chemical, pass distally within the tail tissues and stimulate the observed histological changes.

Excised fragments of tails from larvae older than six hours which normally do not shorten, can be stimulated to shorten with solutions of crystalline trypsin (0.1 mg/ml) in sea water; but younger larvae respond only partially to this treatment.

Berrill's (1947) theory that tail resorption is brought about by shrinkage of the epidermal cells of the tail due to their nutritional exhaustion and autodigestion is rejected.

A hypothesis is proposed to explain tail resorption through the interaction of a proteolytic enzyme released at the base of the tail and the active contraction of the caudal epidermis.

Morphological details are illustrated with camera lucida drawings and 84 photomicrographs.

Microfilm \$2.50; Xerox \$8.00. 175 pages.

A STUDY OF AVIAN TRYPANOSOMES

(L. C. Card No. Mic 60-915)

Timothy Durward Cotton, Ph.D.
University of Minnesota, 1959

A survey of 367 wild birds of 28 species has been made. Three per cent of these birds were infected with trypanosomes. The low incidence among the sparrows, which comprised 80 per cent of the birds, distorts the overall incidence. Excluding the sparrows, 14.7 per cent of the 68 birds (27 species) were naturally infected.

The parasites isolated in culture for a period up to 31 days were infective to baby chicks, and from 31 days up to 4 months were adaptable to baby chicks. The flagellates isolated in culture for more than four months were neither infective nor adaptable to baby chicks.

The parasites were recovered microscopically immediately following intra-venous inoculations but showed a pre-patent period of from five hours to two or more days following intra-peritoneal inoculations. Negative results were obtained from oral inoculations.

No dividing flagellates were seen in the vertebrate host and the experimental results suggest that multiplication does not occur. Upon reaching a peak the organisms gradually decrease in number, showing irregular fluctuating peaks until they are no longer to be found in the blood.

Development of the parasites occurred in *Culex fatigans* and *C. pipiens* (mosquitoes) and *Dermanyssus gallinae* (mites) but not in *Aedes aegypti* (mosquitoes). *Lipponyssus sylvium* (mites), and *Rhodnius prolixus* (Reduviidae). These arthropods failed to transmit the infection under experimental conditions and it was concluded that they were not to be considered in natural transmission.

The health of the vertebrate hosts (chick, canaries, doves and robins) did not appear affected and baby chicks were immune to subsequent inoculations after recovering from an infection.

Microfilm \$2.50; Xerox \$7.40. 160 pages.

STUDIES OF WOOD BORING INSECTS AS VECTORS OF THE OAK WILT FUNGUS

(L. C. Card No. Mic 60-1177)

David Edward Donley, Ph.D.
The Ohio State University, 1959

Research on the spread of the oak wilt fungus, *Ceratocystis fagacearum* Bretz (Hunt), involving natural root grafts and insects that visit the fungus mats is partially reviewed. It is then suggested that the spread of the organism beyond root grafting distance, in geographic areas where mat production is very low, may be due to some species of insect or insects that do not visit the fungus mats.

Insects that develop in trees killed by oak wilt were reared at the Central States Forest Experiment Station Insect Laboratory and four species were selected, on the basis of adult activity, as "type" insects for use in inoculation studies.

Experimental evidence is presented which indicates that the wood boring beetles, *Chrysobothris femorata* (Oliv.), *Urographis fasciatus* (DeG.), and *Pseudopityophthorus minutissimus* (Zimm.), can serve as vectors of the oak wilt fungus. *Neoclytus scutellaris* (Oliv.) was also tested but no inoculations were recorded. The insects were contaminated with a spore (conidial) suspension of the fungus to simulate inoculum which might be present in the forest without the formation of fungus mats. Then the insects were allowed to feed on unwounded red oak (*Quercus rubra* L.), white oak (*Quercus alba* L.), and pin oak (*Quercus palustris* DuRoi) seedlings in greenhouse tests. Of the 134 seedlings exposed to *C. femorata* the fungus was recovered from five (one red oak and four pin oaks). *U. fasciatus* was responsible for inoculation of sixteen seedlings (six red oaks, eight pin oaks, and two white oaks) of the 135 exposed to this insect. Fourteen inoculations (six red oaks, six pin oaks, and two white oaks) were recorded from the 135 seedlings exposed to *P. minutissimus*.

Two inoculations were recorded in field tests by using single surface-contaminated insects sleeved on nursery trees. The foliar symptoms in these two cases appeared twelve months after exposure to the insects, *U. fasciatus* females. In these tests the insects were also contaminated with a suspension of conidia and the trees were not wounded.

Viability, as measured by inoculations, of the conidia appears to be at least 48 hours when these spores are placed on the bodies of wood boring beetles.

Microfilm \$2.50; Xerox \$4.60. 90 pages.

THE ECOLOGICAL BIOGEOGRAPHY OF THE BIRDS OF THE CLOUD FORESTS OF NORTHERN MIDDLE AMERICA

(L. C. Card No. Mic 60-925)

Byron Eugene Harrell, Ph.D.
University of Minnesota, 1959

Cloud forests of northern Middle America occur in the Sierra Madre Oriental, Sierra Madre del Sur, Sierra de Tuxtla and in mountains of Chiapas, Guatemala, El Salvador, Honduras and Nicaragua. Cloud forests are tall closed crown forests predominantly of broad-leaf trees. The climate of cloud forests is characterized by abundant moisture, moderate temperatures, occasional frosts and a small daily amplitude in temperature. Sixty species of birds breed regularly in cloud forests of this region. The geographical and ecological distribution of these species is discussed.

Analysis of the distribution of these birds indicates that the cloud forests of México have been isolated from the eastern deciduous forest of the United States probably since the middle Cenozoic and that the arid barrier between the two forest areas existed throughout the Pleistocene. There is a progressive decrease in numbers of cloud forest birds from south to north along the Sierra Madre Oriental. The northernmost cloud forest in Tamaulipas lacks thirteen characteristic species found in

San Luis Potosí. The Sierra de Tuxtla with one exception is populated by cloud forest birds which also live in tropical forests. The cloud forest faunas of regions along the Pacific coast are alike in lacking four species found in regions along the Atlantic slopes. Many of the sixty species range into southern Middle America; the cloud forests of that region have a large additional fauna.

Possible paleoclimatic characteristics of Middle America are discussed. Climatic changes in Middle America probably correlate with high latitude climatic changes. Cold or glacial regimes in the north correlate with a narrowed subtropical high pressure belt, hot and dry and equatorward in position. Areas immediately south of this belt would probably be cooler and drier. Nearer the equator conditions would be cooler and wetter. Warm or interglacial regimes to the north are correlated with an expanded and poleward subtropical high. South of the high pressure belt the conditions are warmer and wetter, and equatorward conditions are warmer and somewhat drier.

The history of the cloud forest avifauna is reconstructed on the basis of the preceding analysis. Forests resembling cloud forests were widespread in the early Cenozoic, in eastern and western United States and probably in México. At that time the avifauna must have consisted primarily of Old World, North American and Pan-tropical elements. Additional elements entered the cloud forest from South America after closure of the water gap in the Pliocene. Glacial advances in the north resulted in a southward displacement of above five degrees of the subtropical high pressure belt which eliminated most of the cloud forest of the Sierra Madre Oriental. At the same time cloud forest extended along the Pacific coast westward to Guerrero and cloud forest birds reached the Sierra de Tuxtla via tropical forests. Repeated glacial-interglacial changes probably encouraged speciation. In interglacial climatic regimes cloud forest expanded northward and the Pacific region cloud forest became restricted. The Sierra Madre Oriental fauna developed in part from "island hoppers" from Chiapas; the non-synchronous movements of the species probably accounts for the decreasing number of cloud forest species northward.

Appendices include an analysis of the habitat distribution of the breeding birds of the Gómez Farías region, Tamaulipas, of Volcán San Martín, Veracruz, and of the cloud forests near Pueblo Nuevo Solistahuacán, Chiapas.

Microfilm \$2.90; Xerox \$10.15. 222 pages.

THE REACTION OF SKELETAL MUSCLES TO INJURIES AND DISEASE PROCESSES

(L. C. Card No. Mic 60-1007)

Amara Kitiyakara, Ph.D.
The University of Wisconsin, 1960

Supervisor: Professor D. Murray Angevine

In various myopathies, main histologic findings consist of the presence of small, basophilic fibers, a large variation in fiber diameters within the same bundle, and the formation of nuclear clusters or rows within the affected fibers. The present studies involve observations of the

above alterations in (I) degeneration and repair of rat skeletal muscles, (II) in hereditary muscular dystrophy of mice strain 129, and (III) in developing limb muscles of chick embryos. Cytochemical and autoradiographic demonstrations of nucleic acids and chemical fractionations of phosphorylated compounds and muscle proteins were employed.

I. In muscles injured by mechanical, chemical or thermal agents, the fact that newly formed fibers are usually associated with the intact stumps has usually been interpreted as evidence of a budding process from the surviving portion. By the application of a mild injury and examinations of serial sections, the present studies reveal that no interconnections can be demonstrated between the stumps and the regenerating fibers. In areas capable of regeneration, muscle fibers suffer only loss of contractile structures, leaving multinucleated plasmodia which rapidly form new myofibrils. Isolation of pieces of muscle in an omental sac of the same animal also results in rapid regeneration after initial degeneration. These regenerating fibers contain a high concentration of P^{32} -incorporating RNA, but they do not show any capacity to take up the isotope into DNA. The scarcity of mitotic figures and the predominantly diploid content of nuclear DNA indicate that these nuclei do not undergo mitotic division at an observable rate. It is suggested that after most injuries, only areas which suffer milder trauma without significant loss of muscle nuclei and sarcoplasm are capable of regenerating. Budding process from normal fibers is not considered essential for the process.

II. In muscles of mice affected with hereditary muscular dystrophy, true hypertrophy is demonstrated by measurements of fiber diameters and observations of the myofibrillar content. Semiquantitative autoradiography after P^{32} injection indicates that these fibers incorporate the isotope into their RNA at a slower rate in relation to their size. In some fibers, P^{32} is incorporated into nuclear RNA. DNA within the nuclei of these fibers is predominantly diploid, and its synthesis is not readily demonstrable autoradiographically. Nuclear number and distribution indicate that the major nuclear abnormality involves the location of these nuclei within the substance of the fibers instead of below the sarcolemma. Gross chemical fractionations show increased relative activity of acid soluble organic phosphates.

III. In chick embryos given cortisone on the eighth day of incubation, atrophy of limb and thoracic muscles occurs to a greater degree than other groups. However, the formation of myosin and actomyosin is relatively unaffected when compared with other protein fractions. It is concluded that the hormone does not affect the formation of contractile substance preferentially to other fractions.

Microfilm \$2.50; Xerox \$5.60. 112 pages.

THE INFLUENCE OF POPULATION DENSITY
AND HARVESTING TECHNIQUES ON GROWTH
OF THE COMMON GUPPY *Lebistes reticulatus*

(L. C. Card No. Mic 60-932)

Martin Laakso, Ph.D.
University of Minnesota, 1959

Changes in 16 guppy populations were studied during a period of 40 months to assess the influence of density and methods of harvesting on growth rates and population structure. Weekly census and monthly volume records were kept for each group. Constant temperature, light, and water quality were maintained and food was provided in excess. No refuges were provided for the protection of fry. Estimates of fry mortality were based on daily examinations of feces in each tank.

Observations were made on six unmanipulated populations, four of which served as controls for various experiments. Ten manipulated units were maintained for periods varying from 4 to 14 months at densities of 25, 50 and 75 percent of base level. Increments to volume were removed each month to restore density levels and to provide an indication of growth rate in each population. All four size groups were harvested during the first two experiments and only mature fish were removed in the third experiment.

The two long-term unmanipulated control units A and B displayed three intervals of numerical and volume increase and two periods of decline during the 40 months of observation. These units displayed comparable changes but progressive amplitude and period differences between groups developed as a result of variations in reproductive success. Periodic fluctuation in numbers was the result of changing levels of predation and reproductive capacity in each population. The changes in the short-term controls were similar to the changes in units A and B except that successful reproduction did not occur.

In the manipulated populations significantly greater numbers were produced at the 25 than the 75 percent level when all size groups were removed in proportion to their abundance. Greater volumes were produced at the lower density also but the difference was below significance except when the final 6 months of concurrent operation were compared. Gains in biomass at 50 percent level were of the same order as early growth at 25 and 75 percent densities. Optimum density for maximum growth was apparently closer to the 25 than the 75 percent level. The greater success of reproduction was attributed to greater fecundity and less predation at the lower density.

In the final series of observations harvesting was limited to mature fish in paired units at 25 and 50 percent populations. Significantly greater numbers were harvested at the lower density but mean volumes of fish produced were approximately equal. Comparison of production trends at the two levels however, indicated a possible upward trend at the 25 percent level compared to a more horizontal tendency at the higher density. Trend differences indicated that optimum density was closer to 25 than 50 percent when only mature fish were harvested. As in the previous experiment average sizes were greater at the higher density level because of differences in reproductive success. When all groups were harvested production levels at 25 and 75 percent densities showed a declining trend while a more horizontal tendency occurred when

juveniles were protected. The practice of harvesting only mature fish appears to provide a possibility of greater production than when all sizes are taken.

Density effects on fecundity were assessed by comparing the ovaries of fish from control and harvested populations. Significantly greater numbers of embryos occurred in the fish maintained at the lower density. The relationship of embryo number to body length for the grouped data showed an accelerated increase in fecundity with increase in body length. Microfilm \$2.50; Xerox \$6.60. 136 pages.

EPIZOOTIOLOGICAL STUDIES ON SOME
FILARIOID PARASITES OF THE FAMILY
DIPETALONEMATIDAE (NEMATODA: FILARIOIDEA)
FOUND IN CERTAIN SMALL MAMMALS.

(L. C. Card No. Mic 60-1284)

Donald Lee Price, Ph.D.
University of Maryland, 1959

Supervisor: Professor George Anastos

The investigations reported here are (1) a survey of small mammals for filarioid parasites and the determination of the species found, (2) the study of the natural epizootiology of those species available, and (3) the attempt to determine the method of transmission in the laboratory.

Over 1,500 mammals from the United States (mostly from Maryland), Malaya, and one species from Africa were examined for evidences of filarioid infections and 195 of these belonging to 14 species were found infected with 21 species of filarioids, 14 of which were new. Mammals from the United States found to be infected and the number of filarioid parasites in each are *Procyon lotor*, four species; *Sciurus carolinensis*, one species; *Sylvilagus floridanus*, two species; *Mephitis mephitis*, three species; *Didelphis virginiana*, one species; and *Oryzomys palustris*, one species. The mammals from Malaya found to be infected and the number of filarioid parasites in each are *Macaca irus*, four species; *Nycticebus coucang*, one species; *Rattus exulans*, one species; *R. annandalei*, one species; *R. rattus jalorensis*, one species; *Callosciurus prevostii*, one species; and *Canis familiaris*, one species. *Pan troglodytes* from Africa were infected with one species of filarioid. Descriptions are given for new species from *P. lotor*, *Dipetalonema procyonis* Price, 1955 and *Raccoon Dipetalonema* No. 2; from *S. floridanus*, *Dirofilaria uniformis* Price, 1957; from *S. carolinensis*, *Squirrel Dipetalonema* No. 1; and from *M. irus*, *Dirofilaria magnilarvatum* Price, 1959.

Epizootiological studies indicated a close association between *Aedes sollicitans*, *Culex salinarius*, *Anopheles quadrimaculatus* and *Haemaphysalis leporis-palustris* and the rabbit infected with *Dirofilaria uniformis*. Several species were tested but development of the larvae of *D. uniformis* proceeded to the infective stage only in *Anopheles quadrimaculatus*. Laboratory transmission to wild and domestic rabbits was demonstrated.

Studies on *Raccoon Dipetalonema* No. 2 suggest that infection probably occurs in the period from March to June. Since only a few juvenile animals were infected, it is likely that infection takes place away from the den. The

prevalence of this infection was estimated to be above 70 per cent at Patuxent Research Refuge. Most species of mosquitoes associated with infected raccoons during spring and early summer were tested for their suitability as intermediate hosts and all proved to be refractory. Although development failed to take place in larval ticks of *Ixodes texanus*, this species appears to be the most logical intermediate host based on the epizootiological evidence available. If these ticks are the intermediate hosts, they would have to pick up the infection as nymphs and transmit it as adults.

Epizootiological evidence indicates that squirrels may become infected with Squirrel *Dipetalonema* No. 1 at any age. Some of these microfilariae picked up by *T. nigrovittatus* penetrated the gut wall and proceeded to develop to the sausage stage. Because all of these flies died within 72 hours, the suitability of this species as an intermediate host could not be determined. Development was not observed in 10 other species of arthropod exposed to infected squirrels.

One species of microfilariae found in *Macaca irus* was morphologically indistinguishable from *Wuchereria malayi* microfilariae found in man. Microfilariae from both hosts developed in *Mansonia longipalpis* and *M. uniformis* and were considered to be the same species. A second species of filarioid from *Macaca irus*, named *Dirofilaria magnilarvatum*, also developed in *Mansonia longipalpis* and *M. uniformis*. Another species from *Macaca irus* was determined to be a *Dirofilaria*.

Observations suggested that the female dipetalonematids go through three periods of development after the fourth molt. During the first or immature period the parasites grow and develop active genital organs. In the second or mature period copulation and transfer of sperm occurs and during the third or gravid period the microfilariae are produced and released from the female.

Microfilm \$3.05; Xerox \$10.60. 233 pages.

SMALL MAMMAL POPULATIONS IN MOUNT MCKINLEY NATIONAL PARK, ALASKA.

(L. C. Card No. Mic 60-1078)

Eleanor Norton Viereck, Ph.D.
University of Colorado, 1959

Supervisor: Assistant Professor Olwen Williams

This thesis attempts to analyze the ecology of small mammals in several habitats in Mount McKinley National Park, Alaska. The North American Census of Small Mammals census was the method employed. The field work was performed during the summers of 1956 and 1958 which happened to be seasons of moderately high and extremely low population density respectively. The habitats which were surveyed included: early successional stage on river-deposited gravel bars, mid-successional stage on gravel bars, late successional stage on gravel bars, the moraine of the Muldrow Glacier, spruce woods climax, wet tundra climax, and dry tundra climax.

The importance of this study to the subject of animal ecology lies in its contribution of information pertaining to the hypotheses concerning the mechanisms of the regu-

lation of population abundance. The value of the investigation was augmented by the fact that there was a simultaneous investigation of the plant ecology of the area performed by L. A. Viereck (Ph. D. thesis, in progress). Since the population level was much lower in 1958 than in 1956, by a factor of fourteen-fold, the populations during these two seasons were analyzed in order to discover correlations between features of the population and overall abundance. It was possible to reconcile the data of the present study to the hypothesis that cyclic declines in populations are associated with reproductive failure.

The habitat which supported the highest population level during the high year was the mid-successional stage. This was the habitat in which the population decline was the most severe; the density dropped to one twenty-third of its former level. The spruce woods climax and the wet tundra climax habitats exhibited population declines of smaller magnitude. Here, respectively, the populations in the high year were four and seven times their levels in the low year. Since the two most mature habitats, spruce woods and wet tundra exhibited the least severe crash, it is suggested that the more mature habitats were preferred by the small mammals and that the animals were forced into less favorable habitats by crowding during years of greater abundance. These mature habitats were also the two which supported the largest number of different small mammal species.

The two most common species in the study area were the singing vole (*Microtus miurus*) which predominated in the tundra and successional areas and the northern red-backed vole (*Clethrionomys rutilus*) which predominated in the spruce. Of the two, the singing vole suffered the greater decline in abundance. These two species had the greatest ecological amplitudes of any of the small mammals captured, evidenced by the number of different habitats in which they occurred.

Microfilm \$2.70; Xerox \$9.45. 208 pages.

INTERFEROMETRIC MEASUREMENTS OF THE CHROMOSOMAL MASS IN A GRASSHOPPER

(L. C. Card No. Mic 60-954)

Margaret Jean Watkins, Ph.D.
University of Minnesota, 1959

Within recent years it has become possible to measure the dry mass of certain components of cells with the interference microscope. In this investigation, a Cooke-Dyson interference microscopic with comparator eyepiece was used to measure the dry mass of unfixed chromosomal material in three different types of cells from the grasshopper, *Melanoplus differentialis*.

The first part of the study dealt with sets of chromosomes from primary spermatocytes. Early in diakinesis, the chromosomes are long, thin and extremely fuzzy. By metaphase they have become shorter, thicker and appear to have sharp boundaries. Measurements with the interference microscope showed an increase in total mass of the chromosome set from 41×10^{-12} grams to 66×10^{-12} grams as the chromosomes decreased in total length from about 118 to 51 microns. The regression line of mass on length has a slope of $-.24$ corresponding to an increase in

mass of 2.4×10^{-12} grams for a decrease in length of 10 microns. This increase in mass was interpreted as due to the retraction of lateral loops of chromosomal material which give the "brushy" appearance to diplotene chromosomes. Since the loops were too thin to be seen in the interference microscope except where they parted from the chromosome proper, they would not be included in the measured mass of the early diakinesis chromosomes. In pre-metaphase chromosomes where the boundaries appeared sharp and no such loops were indicated, the total mass was probably measured. It may be that the retraction of the lateral loops represents the change from a genetically active to inert state of the chromosomes in preparation for cell division.

A second part of the study dealt with the mass of developing spermatids in *M. differentialis*. The spermatid nucleus in this species changes from nearly spherical in early stages to a long, thin thread in the mature sperm. Electron micrographs have shown that this change in shape is accompanied by profound internal reorganization. Mature sperm could not be measured with the interference microscope due to their extreme thinness, but earlier stages were measured. Early, medium and late stages were distinguished on the basis of the ratio of length to

width in the squashed preparations. The mass of ten early spermatids was $21 \pm 2 \times 10^{-12}$ grams, of twenty-three medium and late spermatids $18 \pm .4 \times 10^{-12}$ grams. The probability is 0.20 that the difference between the two means is due to chance alone ($t = 1.33$ with 12 degrees of freedom). The average mass of all 33 spermatids was $19 \pm 1 \times 10^{-12}$ grams, slightly greater than 1/4 that of metaphase chromosomes in meiosis. This would indicate that even early in spermiogenesis, the nucleus contains little other than chromosomal material.

In many somatic cells of insects, the chromosomes are visible in the resting nucleus as separate irregularly shaped bodies. This is true of the sheath of the grasshopper testis where the cells are relatively flat and may be diploid, tetraploid or octoploid. The masses of these chromosomal bodies were $31 \pm 1 \times 10^{-12}$ grams, $65 \pm 3 \times 10^{-12}$ grams and roughly 116×10^{-12} grams in cells judged to be diploid, tetraploid and octoploid respectively. Therefore these bodies probably contain all the chromosomal material in the interphase nucleus.

From these data, it would appear that the haploid mass of nuclear material in *Melanoplus differentialis* is about 16×10^{-12} grams in three very different types of cells.

Microfilm \$2.50; Xerox \$4.80. 94 pages.

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